Rock Products

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Making Sand-Lime Brick a Straightforward Process at Pengilly

This Swan Lake Brick Co. Turns Out 50,000 Brick Daily with Two Presses. The Storage Shed Accommodates 5,000,000 Brick

By J. Guy Hall
Engineer, Duluth, Minn.

THE manufacture of sand-lime brick is not a new industry in the United States. The first plant dates back about 20 years, but in the past few years the industry has developed rapidly and many new plants have been built. The more recent plants are built on modern lines with the best equipment and labor-saving machinery obtainable. The quality of the brick is uniformly good throughout the country, and many architects and engineers prefer sand-lime brick to clay brick because of their uniform size, straight edges, and resistance to fire.

A very good example of a modern and efficient plant is at Pengilly, Minn., operated by the Swan Lake Brick Co. The plant was designed and built by R. L. Hall, organizer and general manager of the present company. The general layout is such that the manufacture of sand-lime brick is a simple, straightforward process, with each department operating as a unit, and all departments combining to make up a smoothly running plant. Recent government tests show that sand-lime brick made at Pengilly have greater tensile and compressive strength, less absorption, and greater fire resistance than any other kind of common brick made.

The sand-lime brick plant of the Swan Lake Brick Co. at Pengilly, Minn.

The Power Plant

Because of the fact that high-pressure steam is necessary to "cook" the brick, most plants use steam power to drive the machinery. At Pengilly a building 30 ft. by 90 ft. houses the power plant equipment. Coal is unloaded from the cars direct to storage space in front of two horizontal fire-tube boilers, rated at 150 hp. and carrying 150 lb. working pressure. These boilers are put into use alternately, one being held in reserve, which gives constant boiler service but makes it possible to cut one boiler out when it becomes necessary to clean or repair it. The operating boiler supplies steam to the engine, to the brick cylinders, and to the dies on the brick presses.

All steam condensed in the system is returned to the boiler by Crane tilt traps. In order to keep water out of the engine cylinders a large condenser has been put in the main feed line. The engine is a Ball & Wood cross-compound rated at 225-hp. and gives excellent service.

The water supply comes from a deep-driven well. There are six 3-in. well points connected to a common header which in turn leads to an 8-in. pipe that feeds direct to a Fairbanks-Morse deep well pump, having an 8-in. diameter cylinder with a 36-in. stroke. Water is pumped to a storage tank at the top of the hydrate plant from which it supplies the hydrator, mixers, and boilers.

The Hydrate Plant

In the manufacture of the brick the hydrated lime used is hydrated at the plant. The lime required is a very high calcium with practically no trace of magnesia. The burned limestone, or quick-lime, is shipped to the plant in box cars and shoveled from the car floor to a hopper which feeds a No. 1½ Sturtevant gyratory crusher.

The crusher, which reduces the material to about ¼-in. size, discharges to a belt conveyor that carries it to the boot of a bucket elevator of about 60 ft. centers. This elevator discharges into a 60-ton raw lime storage bin at the top of the hydrate building. The material feeds by gravity to a measuring spout, or hopper, which measures accurately the amount of crushed lime for each batch. From this hopper the material is dropped into the pan of a No. 3 Clyde hydrator, the proper amount of water is added, and hydration takes place. A very important part of making sand-lime brick is to get a perfect hydrate. If the lime is not thoroughly hydrated, when green brick go into the steam cylinders, the brick are a total loss.

The particles of raw lime hydrate in the green brick when the brick are subjected to high pressure steam, and the result is brick that are checked and cracked. The hydrator has given excellent service from the time it was installed. The first cost was reasonable, the hydrate perfect, and the upkeep practically nothing.

From the hydrator the material is dropped into a hydrate hopper, passes through a rotary feeder, a spiral conveyor, and then through a separating process that removes all core and impurities. The finished hydrate is carried by an elevator to the third floor of the main building, and is reclaimed by a spiral conveyor which deposits it in 30-ton storage bins above the mixers. The core taken out in the separating process is ground and returned to a small bin at the top of the mill, from which it is run through the separating process again.

This sand deposit comprises about 40 acres of almost pure sand, with fine sharp grains. It has a depth of more than 100 ft. and is uniform throughout, with no loam or clay

Burned limestone is shipped to the plant in box cars. Then shoveled from the car floor to a hopper feeding this No. 1½ crusher, which reduces the material to ¼ and under

The Sand Department

The plant is on one of the best deposits of sand in the country, the land comprising an area of about 40 acres. Over the entire area there is a deposit of almost pure silica sand, extending to a depth of more than 100 ft. The sand itself is almost pure white, with fine sharp grains. The deposit is uniform throughout, there being no clay or loam to contend with, and is an ideal sand for making brick.

Horses and a slip scraper are used to take the sand from the pit to a hopper which discharges into an elevator boot. The elevator carries the sand to the top of the mill and discharges into a rotary screen which takes out all pebbles over ¼-in. The sand drops through the screen into storage hoppers over the mixers, while the gravel feeds to a belt conveyor which deposits it in gravel bunkers. These bunkers are so situated that they will feed by gravity to gravel cars on the main railway side track.

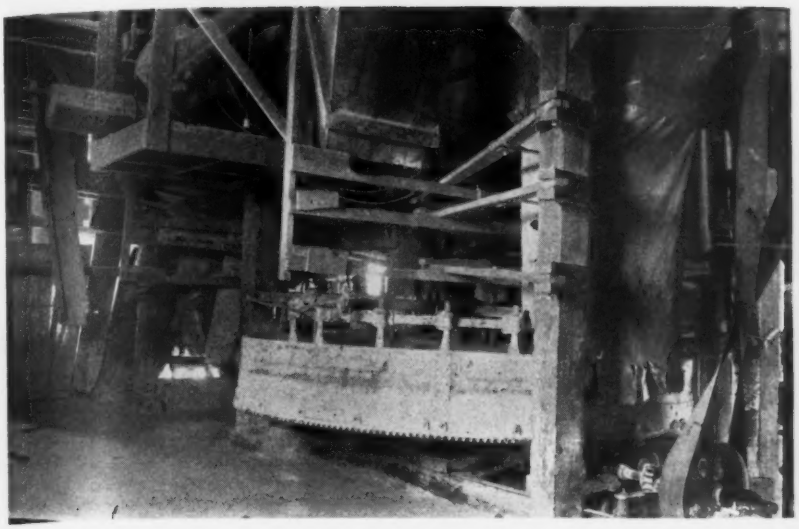
The Mixing Department

The mixers used in this plant are special machines made by H. Miscampbell of Duluth, Minn. They are of the same general design as the hydrator, with a revolving pan and stationary plows, but have no hood or stack, and have a shallower pan. This type of mixer has proved to be very satisfactory, mixing the material thoroughly and quickly.

Directly over each mixer are the hoppers containing sand and hydrated lime. These hoppers have graduated spouts in which the materials are measured in the proper proportions and drawn into the mixer. The sand and lime are mixed dry until a uniform product is obtained, and then enough water is added to bring the material to the proper consistency for pressing. The mixing job is important as the material must have just the right proportion of sand, lime, and water. Much variation from what is "just right" will cause trouble for the press men. After the material has been properly proportioned and mixed it is dropped into hoppers over the presses.

The Press Room

The presses are also special machines made by the Illinois Construction Co. of St. Louis. They are called the Grath four-



The mixer used for the sand and hydrated lime is an improvised hydrator, with a revolving pan and stationary plows, without hood or stack. The pan is shallower than the regular hydrator

mold press, and are made extra heavy in order to give the brick greater pressure than is generallly given sand-lime brick. These presses have given excellent service for several years.

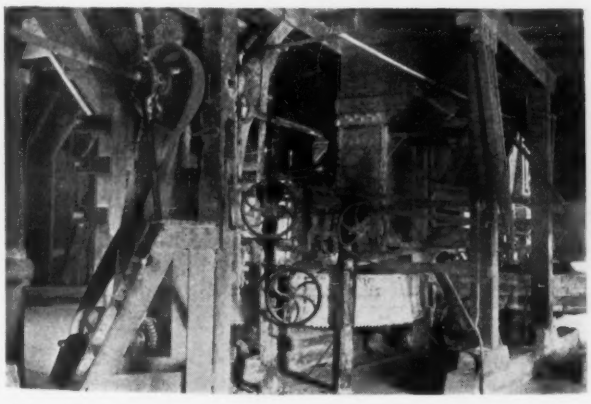
All the material is fed down from the hoppers through canvas boots and into a charger box on the press. At every revolution of the machine this charger box is pushed forward over the mold boxes. The material drops from the charger box into the mold boxes. The charger box sliding back to its original position smoothes off the material in the mold boxes even with the top of the opening. The four dies then come down into the mold boxes, subjecting the mixture to great pressure. The dies are then lifted out and the lower dies pushing up from the bottom, lift the green brick to a level with the top of the mold boxes. A push board fastened to the front of the charger box pushes the brick out on a table at the front of the machine, from which they are taken by the press men and loaded on the cars. The brick are pushed out of each press at the rate of 40 per minute, and are piled on steel cars which have a capacity of over 1000 brick.

The Brick Cylinders

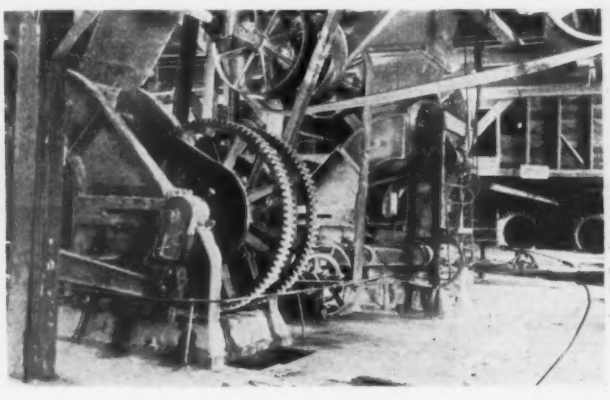
Loaded on the steel cars the green brick are pushed down the track to the steam cylinders where they are cooked. These cylinders are 6 ft. in diameter and 84 ft. long, and are constructed of heavy boiler plate. The two ends are made in such a way that they can be swung open and to one side when the cylinders are being loaded or drawn, and then swung back into place again and bolted tight before the steam is turned on. Down the center of the cylinder, and supported on small cast iron brackets, there is a continuation of the narrow-gage track found throughout the mill and yard. A small section of temporary track is used to connect the track in the cylinder to the track in the yard and in the mill, when the cylinders are being filled with cars, or drawn.

Left—R. L. Hall, organizer and general manager. Right—H. Miscampbell, inventor and manufacturer of the hydrators and mixers used in the Pengilly plant

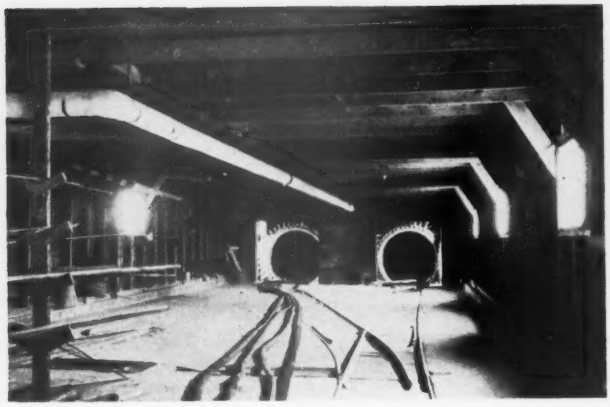
After pushing in 24 cars of brick the ends of the cylinders are swung into place and fastened by specially constructed bolts. The steam is turned on from the boiler and the pressure gradually increased until about 140 lb. is reached. This pressure is maintained for 8 hr., at which time the brick are "cooked" and the cars are drawn from the cylinder into the storage shed, 12 at a time, by means of a cable and a small winch. After allowing the cars to stand until the brick are cool enough to handle, they are



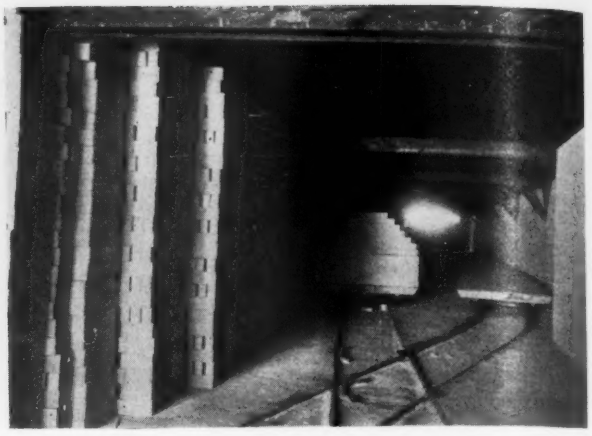
The mixing department, showing mixers and feed spouts from the sand and hydrated lime departments. After mixing the sand-lime, the mixture is ready for the presses immediately below the mixing room



The rear and front end of the vertical, four-mold, extra heavy brick presses. Track from the presses leads to the hardening cylinders shown in the background. Each press has a capacity of 40 brick per minute



The cylinders in which the green brick are cured are 6 ft. in diameter and 84 ft. long. They are built of heavy boiler plate. Each cylinder holds 24,000 brick. To cure the brick it requires 8 hours' "cooking" at 140-lb. steam pressure



Interior of the storage shed showing how the brick are piled. No turntables are used or transfer cars; everything is done by switches and cross-overs

piled in stock or loaded directly into box cars for shipment by means of gravity carriers.

The Storage Shed

The storage shed is 100 ft. wide by 300 ft. long. The trusses span 100 ft. and are

The lady cook. One of the manufactured products of this efficient young woman is "corn fixin's" that won the heart of a "Rock Products" editor on his visit last summer

spaced every 20 ft. The floor is 6-in. plain concrete on tamped earth. There are three rows of narrow-gage track running the full length of the shed, one from each of the two cylinders, and one taking the empty cars back to the press room. There are no transfer cars used on this miniature railroad.

Six regular switches, two cross-overs, and about 1500 ft. of track make up the complete system. The track is so laid that loaded cars from the time they leave the presses run on a slight down grade to the cylinders, through them, and the length of the storage shed. This feature does away with the labor generally required to push cars. Brick are never carried or wheeled in this storage shed. Gravity carriers are used to transfer the brick to stock piles or for loading direct to the box cars.

The Bonus System a Success

A system has been tried out at this plant that has proved beneficial for both the brick company and the men employed at the plant. A standard has been set for a day's work and a rather generous bonus is paid the men for every additional thousand brick made. The result is that the presses do not stop even when changing cars. The men on the machines are very careful to see that nothing happens to their machine which would slow up production, as this would mean a smaller bonus. The superintendent does not have to worry about any one intentionally "stalling" a machine, or "lying down on the job." The men themselves will not stand for this as it tends to reduce the bonus for all concerned.

Cement Industry of France

THE French cement industry appears to have taken on a somewhat brighter aspect, reports Vice-Consul Davis B. Lewis. Cement factories in the Boulogne district report improved demand, and in consequence the plants are working full time in anticipation of continued orders from England and Ireland. The reflection of the exchange situation in the price of coal has caused an increase in cement prices of 8 francs per ton. Latest quotations are 118 francs per metric ton plus 40 francs for sacks.

Important movements of cement are contributing to the general activity of the port. Large shipments have recently been made, and other loadings of considerable tonnage are under way for the west coast of Africa. Total shipments from Boulogne by water during October amounted to 9986 tons.

Actual exports of cement from Boulogne to Great Britain have begun, cargoes of 1,164,373 and 300 tons having already gone to Newcastle and Dublin, where the quality of French cements is recognized and highly appreciated. The Michael Murphy Steamship Co. is contemplating the establishment of a regular line betwen Boulogne and Dublin to care for the cement traffic. The prospect of an extension of the cement trade between French producers and British consumers is a matter of much importance and satisfaction to the Boulogne industry.

Building industries in southwestern France have of late taken on such an impetus that the Societe des Chaux et Ciments du Languedoc has started its second furnace and plans to start a third one at once. The daily production of cement will shortly exceed 2500 sacks. The Societe des Produits Industriels de Paris has taken over the Societe des Ciments Portland francais de Bettrechies-lez-Bavay. The capital of the Societe des Ciments et Chaux d'Angoulemesur-Mer has been increased from 1,000,000 to 1,500,000 francs. A company capitalized at 240,000 francs has been organized at Rheims to exploit the Polla and Cornaz patents for cement manufacturing processes.

Building Officials to Visit Ohio Lime Plant

THE next annual meeting of the Building Officials Conference will be held in Toledo, April 24, 25, 26 and on Friday, the 27th, will visit a large lime plant.

The National Lime Association, a subscribing member, has extended an invitation to the members to visit a modern lime plant in the vicinity of Toledo. This will take an entire day. Secretary Lummis says that "This association is also to join with us probably on the 26th, in a joint session de-probably on the 26th, in a joint session."

Cement Will Solve Many Asiatic Problems

Part II.—Great Masses of Asia's Population Have Not as Yet Learned of Cement's Manifold Uses

By Paul C. Van Zandt
Chief Engineer, Asano Portland Cement Co.

JAPAN has 21 operating cement companies which have a productive capacity of 500 bbl. or more daily. Three of these have a capacity in excess of 1000 bbl. daily. The Onoda Cement Co., which is the oldest concern in Japan, now has three modern well equipped factories strategically located in Onoda (Japan), Korea, and Manchuria. Their total capacity of about 5000 bbl. daily has been included in the writer's statistics under Japan.

The new Hokoku Cement Co. has a capacity, when running full, of 2000 bbl. daily. This plant, the Onoda and the large Asano plants are equipped or being equipped with waste-heat boilers, which will result in conserving the coal resources of Japan, which are not very great.

The Iwaki, Aichi, Oita, Tosa, Kidzugawa, and Osaka Yogyo plants are rated as 1000 bbl. plants of modern construction. One or two new plants are now building or being promoted.

It will be noted that the productive capacity is somewhat greater than the recorded yearly production, which is due to new equipment being added during the year and to the impossibility of operating all plants to 100 per cent capacity throughout the year. Japan's production has increased from year to year in a quite normal manner, doubling during the war and promising an increase of perhaps 10 per cent yearly for some time to come.

The exports amount to roughly 10 per cent of the production, while 90 per cent is consumed locally. These exports should continue in equal or increasing amounts as the demand in other countries increases beyond their capacity to produce, due to the ability of the Japanese to manufacture an excellent cement in large quantities at a reasonable price. The tables of exports show the flexibility of the Japanese export trade, flowing here and there as the demand grew and retrenching where the demand decreased without greatly changing the total trade.

Japan does not not import cement from other countries. The comparison of domestic and export prices from year to year shows clearly how when the Japanese exports were first made the foreign price was higher than the domestic in an amount sufficient to attract the manufacturer and the exports jumped from 1 to 17 per cent, or actually more than 13 times, in the first four years. On the rising market of the war times the export price was sluggish, but since 1920 the export and domestic prices have remained practically the same. At the time of writing the market seems to indicate a stiffening of both.

The cement consumed locally in Japan is used almost entirely by Japanese with Japanese capital. The small individual user predominates, while the government railways are the largest single customer. Cement in Japan is found in every part of the country, especially on the South and East coasts. It is used for foundations of small houses, floors and steps. Likewise, cement is found in the small bridges, culverts and ditches in increasing amounts. Even temples and torii are made of it, while schools and office buildings are being built of concrete in larger numbers every year. Large dams, etc., are always built of cement now. In fact, the most interesting and encouraging thing is the wide general use for this material. What Japan needs most at present is fireproof small houses in the big congested cities, and concrete roads. This is the business of the future in Japan as neither of these great needs are being provided for as yet.

Cement Manufacture in China

There are four producing cement companies in China. The Onoda Cement Co. has a factory at Dairen (Dalny) in the Japanese leased territory in Manchuria. This has already been mentioned. There is also a small cement plant at Tsingtao, now under Japanese control, which was originally built by the Germans when they were at Kiaochou, and which has a small capacity by the old shaft kiln process. The writer is not aware that this plant is being operated at present.

The largest plant is that of the Chee Tsin Cement Co. at Tanghsan, between Tientsin and Shanghaikwan on the railway to Mukden. This is a double plant, half wet and half dry process, very modern and equipped principally with Danish cement machinery. The Chee Tsin Cement Co. enjoys a monopolistic concession from the late Ching dynasty for the manufacture of cement in certain provinces of China and there is no operating cement company in all China north of Canton except the Chee Tsin and the two in leased territory. The Tangshan plants have (or will have this year) a capacity of about 3000 bbl. daily. The raw materials are immediately adjacent to the plant, which is in the center of the coal fields. This company is therefore able to produce an excellent product at a very low cost, but the transportation facilities seem to be inadequate to allow it to distribute it to the best advantage. It is a Chinese company but has foreign experts in charge of manufacture.

The Chee Tsin brand is the "Horse," but

EXPORTS OF CEMENT FROM JAPAN TO OTHER ORIENTAL COUNTRIES

Year	North China		Kwantung		British India		Straits Settlements		Dutch East Indies		Philippines		Total Exports		Domestic Price
	Bbls.	Price, yen	Bbls.	Price, yen	Bbls.	Price, yen	Bbls.	Price, yen	Bbls.	Price, yen	Bbls.	Price, yen	Bbls.	Average Price, yen	Average
1917	35,950	5.12	62,700	5.47	83,400	5.16	44,700	5.26	263,000	4.85	23,850	5.24	525,000	5.09	6.80
1918	36,000	6.30	185,500	6.60	110,000	7.09	106,200	6.50	385,000	6.59	82,700	6.34	902,000	6.66	7.40
1919	65,500	6.33	414,000	6.55	92,700	6.52	47,000	6.51	243,500	6.63	131,000	6.19	1,000,000	6.54	6.19
1920	79,750	8.96	161,600	7.52	1,348	8.75	63,700	8.97	426,800	9.38	388,000	8.38	1,153,000	8.66	12.17
1921	175,000	6.64	179,000	7.39	122,100	7.44	14,280	7.22	312,000	7.01	159,500	6.68	995,000	7.11	7.00

LIST OF CEMENT COMPANIES IN THE JAPANESE EMPIRE

Name	Location	Capitalization, yen	Monthly capacity, bbl.
Asano Cement Co.	Tokyo, Moji, Kawasaki, Hokkaido, Formosa	33,000,000.00	510,000
Onoda Cement Co.	Onoda, Korea, Manchuria	7,500,000.00	150,000
Kokoku Cement Co.	Karita	5,000,000.00	75,000
Miye Cement Co.	Yamada	4,000,000.00	15,000
Iwaki Cement Co.	Yotsukura	3,000,000.00	30,000
Aichi Cement Co.	Nagoya	3,000,000.00	30,000
Oita Cement Co.	Oita	3,000,000.00	25,000
Nippon Cement Co.	Yatsushiro	2,500,000.00	50,000
Tosa Cement Co.	Kochi	2,000,000.00	30,000
Nagoya Cement Co.	Nagoya	2,000,000.00	20,000
Toa Cement Co.	Amagasaki	1,500,000.00	18,000
Kidzugawa Cement	Osaka	1,400,000.00	25,000
Chuo Cement Co.	Kurosaki	1,000,000.00	20,000
Asahi Cement Co.	Wakayama	1,000,000.00	15,000
Teikoku Cement Co.	Kumamoto	1,000,000.00	(Building)
Saga Cement Co.	Saga	800,000.00	20,000
Osaka Yogyo	Osaka	4,000,000.00	30,000
Sakura Cement Co.	Oita	800,000.00	20,000
Hinode Cement Co.	Aomori		15,000
Suzuki Cement Co.	Tokyo		15,000
Nippon Chisso Co.	Mizumata, Kagamimachi		25,000
Denki Kagaku Kogyo	Omuta		15,000
Mikawa Cement Co.	Taharamachi	500,000.00	5,500
Yoshikawa Cement	Okayama	200,000.00	2,000

The Osaka Yogyo Kabushiki Kaisha manufactures brick and tile as well as cement. This is one of the largest common brick manufacturers in the East.

The Denki Kagaku Kogyo K. K. and the Nippon Chisso K. K. both make cement from calcium carbonate by-product from the manufacture of ammonia and fertilizer by the calcium cyanimide process, and their principal business is manufacturing fertilizer.

There are a few cement companies smaller than any of the above which are not listed.

Some of the above companies are enlarging and improving and one or two new companies in process of promotion.

The producing capacity of Japan will be about 1,000,000 bbl. per year greater on January 1, 1923, than it was January 1, 1922.

JAPANESE CEMENT PRODUCTION AND EXPORT FOR 15 YEARS

Year	Production	Price yen	Exports	Price yen	Exports Production Pct.	Exports Price Pct.
1907	1,747,534	4.53	.....	.....	.....	.....
1908	1,794,695	4.61	.....	.....	.....	.....
1909	2,331,361	3.98	.....	.....	.....	.....
1910	2,638,709	4.00	.....	.....	.....	.....
1911	3,125,148	3.96	.....	.....	.....	.....
1912	3,821,279	3.76	51,000	4.66	1.34	124
1913	4,562,237	3.59	156,000	4.21	3.42	117
1914	4,415,476	3.11	261,000	3.96	5.92	127½
1915	4,096,456	2.95	699,000	3.52	17.10	119
1916	4,772,539	4.19	675,000	4.03	14.15	96
1917	4,654,543	6.80	525,000	5.09	11.27	75
1918	6,165,566	7.40	902,000	6.66	14.63	90
1919	6,500,000	6.19	1,000,000	6.54	15.37	105½
1920	9,300,000	12.17	1,153,000	8.66	12.40	71¼
1921	10,000,000	7.00	995,000	7.11	9.95	101½

LIST OF ORIENTAL CEMENT COMPANIES
(Other than Japanese)

Name and Location—	Monthly Capacity bbl.
CHINA	
Chee Tsin Cement Co., Tangshan	80,000
Chee Tsin Cement Co., Hupeh	15,000
Green Island Cement Co., Kowloon, Hongkong	60,000
Kwantung Cement Plant, Canton	17,000
Indo-China Cement Co., Haiphong	60,000
INDIA	
Dwarka Cement Co., Dwarka	50,000
Katni Cement Co., Katni	16,000
Bundi Cement Co., Lakheri	13,000
Indian Cement Co., Porbander	10,000
Madras Cement Co., Madras	5,000
MISCELLANEOUS	
Singapore Cement Co., But Cape, Singapore	15,000
Padang Cement Co., Padang, Sumatra	20,000
Bangkok Cement Co., Bangkok, Siam	13,000
Rizal Cement Co., Manila, Philippines (stopped)	12,000
NEW PLANTS BUILDING OR IN PROCESS OF PROMOTION (Building)	
Shanghai Cement Co., Shanghai, China	12,000
Wusih Cement Co., Wusih, China	10,000
Cebu Cement Co., Cebu, Philippines	20,000
Gwaloir Cement Co., Gwaloir, India	25,000
Central Provinces Co., Jubblepore, India	50,000
(In Process of Promotion)	
Rhotas Cement Co., Bihar State, India	.....
Jubblepore Cement Co., Jubblepore, India	.....

The Korean and Manchurian factories of the Onoda Cement Co. are listed under Japan, although Manchuria is a part of China.

There is a small plant at Tsing Tao, Shantung, China, which was built by the Germans during their occupation.

The writer does not guarantee extreme accuracy in the capacities given. At last reports several new plants were under promotion in India.

about six years ago this company took over the operation of the Hupeh Cement Co.'s plant on the Yiang Tse Kiang near Hankow, and cement made in this plant is marketed under the "Pagoda" brand.

There are two new plants building at Shanghai and Wusih, near Nanking, but neither will be ready for production for several months or a year. Both plans are small.

The second plant in China is the famous Green Island Cement Co. at Hongkong. This is British owned and operated, and makes an excellent cement which has been known throughout the East for many years. It is built on the mainland at Kowloon, across the harbor from Hongkong proper, but within the British concession. The plant was modernized shortly before the war and the machinery, while a little small, is good and well operated. The limestone comes from Chinese controlled territory near Canton and a few years ago the Chinese authorities placed an embargo on the export of this stone, much to the embarrassment of the Green Island company. This has been removed now and the raw material is easily obtained and is of excellent grade. There was a small branch plant at Macao which the writer understands is not now in operation.

The Chinese government operates a small plant at Canton, using the same materials as does the Green Island concern. The fact that it is under government control has resulted in rather a varied operation. It has operated under capital borrowed from the Japanese Bank of Taiwan.

The Indo-China Cement Co. at Haiphong, French Indo-China, is a French concern with a good plant, now having a capacity of nearly 2000 bbl. a day.

In the Philippines there are two cement companies—the Rizal and the Cebu. The former was built in 1914 by Krupp of Germany and operated for about two years. The capacity was less than 500 bbl. daily and the raw materials were lime rock and volcanic "tufa." The plant has not been in operation for the past few years.

The Cebu plant is now building with the most modern American machinery, and while it will have only about 800 or 1000 bbl. daily capacity, it will be quite up to date in every respect. The great drawback to manufacture of this kind in the Philippines is the scarcity of suitable fuel. Oil is now being found in abundance in Borneo and vicinity, however, and is available for this purpose.

A modern plant was recently built at Singapore and another at Bangkok. The capacity at both places is small.

Cement Manufacture in India

India has five or six operating plants. The largest and newest is the Dwarka, on the sea coast north of Bombay. This plant is American equipped throughout, has two rotary kilns and is as modern as any plant in the world. One unit is already producing and the second kiln will be fired this year.

The three next in size are the Katni, Bundi and Indian Cement companies, respectively. All of these are comparatively old, having been in operation for some years. There are several new plants being promoted or building.

The table of imports of cement into India shows the demand which has grown since the close of the war beyond these figures. India is still a cement importing nation, as are all the other countries in the Orient, excepting only Japan. China both imports and exports. This is brought about by the relative inconvenience of transportation. This is not true of India, and once India makes enough for domestic consumption she may take her place as an exporting country.

IMPORTS OF CEMENT INTO INDIA FOR FIVE YEARS

Year	By gov't bbl.	By others bbl.	Total bbl.
1913-4	862,000	170,000	1,032,000
1914-5	851,000	126,000	977,000
1915-6	774,000	64,000	838,000
1916-7	526,000	48,000	574,000
1917-8	494,000	10,000	504,000

The above figures show there was already a consumption of cement in India prior to the war of 1,000,000 bbl. annually more than the local production, and that about one-fifth was used by other than the government. This excess of consumption will be entirely taken care of by the present building cement factories, but in turn the resulting lowering of price by domestic production will stimulate consumption and India will take her place as a great cement producing country.

There is a small cement plant on the Island of Sumatra, Dutch East Indies.

Next to Japan, India promises to become quite a cement-producing country. When the contemplated plants are all producing, India should make between 3,000,000 and 4,000,000 bbl. annually.

It is difficult to forecast the future, but it is apparent that the cement industry is firmly established in the Orient and has already grown to wonderful proportions in Japan. The newest plants are remarkably modern and well equipped, while the old companies which have been progressive have kept abreast of the times and operate modern plants as well. Those which were established some time ago and have not been able to remodel are of such small capacity that the writer believes that a larger percentage of cement is made in modern plants by modern methods in the Orient than is the case in Europe and as large a percentage as is the case in America. It does not follow from this remarkable fact that the operators are as skillful as those of the European and American countries. The reverse is true, of course, and a generation or two must pass before the individual skill of the Oriental worker may begin to approach that of his white brother. Oriental labor is paid less for a day's time than is paid anywhere else, and yet the writer has yet to find a cement plant where the actual labor cost per barrel of cement produced is not materially higher than it is in the United States where labor is paid the highest wage.

In the writer's opinion the next few years will see as great an increase in production and consumption, in proportion, as the past. Whether the consumption of cement in the Orient will ever reach the amounts used per capita in European countries or America, the writer cannot say, but the logical expectation is that the consumption will slowly grow in consonance with the purchasing power of the teeming millions of Asia as they slowly advance in Western material civilization.

The value of cement to the Orient is beyond belief and once its use becomes widely extended the great sum total of human suffering in Asia will be immeasurably reduced. The intelligent construction, once for all time, of the great cement structures necessary for the control of rivers, together with reforestation, will make it possible to stop floods, famines, pestilence and even revolutions and other disastrous political upheavals resulting from these things, and lack of transportation, as nearly as it is possible for human-kind to eradicate such.

The structures in which cement is used are for the most part public buildings, offices, bridges, dams and large factories at present and in Asia the small user of cement in retail quantities has not yet been developed.

By far the greatest need for cement is in road construction. The Japanese government and Tokyo city engineers have devoted a great deal of study on this subject, and when concrete roads are once commenced in Japan the use for cement will double and the country will be opened up for travel as it never has been heretofore. It is the writer's opinion that Japan will lead the Orient in building good wide concrete roads in the very near future, to her great advantage.

In China and Asia proper the need of roads of any kind whatsoever is so great that it seems superfluous to say "concrete." China's great famines are caused by floods, droughts or revolution, and *lack of roads* to carry the surplus from one district to another in great need. These famines have cost China, and the rest of the world as well, many times the cost of permanent works to prevent them. The people are pitifully poor as a result of too often repeated futile efforts to build from mud and wood structures that should be made once for all in steel and concrete. The writer believes that the change has already begun in China toward permanent concrete structures.

The fact that roads, bridges and permanent buildings, dams, drains and railways constitute a large part of the real wealth of a nation, available to all, and that the use of cement may be taken as a very fair measure of the advancement of a country, or at least of its material prosperity, never impressed the writer forcibly until he traveled where none of the forms of wealth was to be found. The comparison is so striking and the value of these forms of wealth to the humblest worker is so apparent that one is prone to ascribe all the troubles and poverty of a country to its lack of capital. This undoubtedly is fallacious, as Nature is so lavish that all the peoples of the world can have all they need if they will only work intelligently for it. Asia is slowly and in her own way starting forward toward the goal of better living for all, resulting from the public accumulation of material wealth.

At the present time, however, in all Asiatic countries excepting Japan most of the cement used by private enterprise as well as for railways, highways, etc., is consumed in structures originated by the enterprising "foreigner" who builds as he does at home in Europe or America. This example is taken up very slowly by the wealthy and intelligent native and an almost inconsequential fringe of material advancement has already appeared. The cement users are still, however, the governments in their railways, bridges, etc., foreigners in their buildings, and a few private individuals who are progressive and in contact with the outside world.

The great mass of Asiatic population has yet to learn of this wonderful material.

Quarry Operators and Engineering

"DURING recent years I have visited about 600 stone quarries," states Oliver Bowles, mineral technologist of the Bureau of Mines, in Serial 2429, just issued.

"Many of these quarries are highly efficient operations, but on the other hand I find some processes in use that are as crude as those employed in Egypt when the pyramids were built."

The employment of inefficient methods is due partly to lack of capital, partly to tradition or to the influence of methods used in surrounding operations, and partly to unusual quarry conditions, but one great outstanding lack is the failure to apply the principles of engineering to the problems encountered. Some problems may require the experience and knowledge of a trained engineer, and he should be called in consultation. In many instances, however, the operator is quite capable of solving his own problems by applying to them two important engineering principles.

"The first principle is the ability to see both sides of a question, to weigh the evidence impartially, and to dismiss from consideration any preconceived opinion as to the most desirable solution of the problem.

"The second important principle is the establishment of conclusions on a sound basis of fact. Thus the preparation of positive data is a necessary function of any investigator, and this can be done only by keeping exact records of tonnage and costs. Few economic problems can be solved without using figures, and no quarryman can hope to solve his problems without the aid of systematic records. Many processes now in use would be abandoned tomorrow if the operator had before him on a sheet of paper a set of figures indicating their excessive cost."

Rates of Hydration of Cements Show Distinct Variation

AN investigation on the rates of hydration of various types and brands of cement is being conducted in the chemical laboratory of the Illinois Bureau of Materials. Several determinations allowing hydration periods of from 30 sec. to several days have already been made and it is planned to continue the investigation to include samples which have hydrated for several months. Results so far obtained indicate that hydration on different brands of cements progresses at rates which vary within wide limits.

Using similar methods, the effect of calcium chloride and other curing materials upon these rates will also be investigated.

Pulverized Lime to Dissipate Fogs and Cause Rains!

Novel Suggestions by a Famous Editorial Writer

HOW many lime manufacturers noticed the "Today" editorial by Arthur Brisbane in the Hearst newspapers of February 13? It is interesting and entertaining to say the least. There is undoubtedly some food for thought in what he says. In any event, it adds another bit of evidence to our firm belief in the universal utility of lime.

Mr. Brisbane says: Shall we ever make the rain fall? Undoubtedly. Man can do anything that he can imagine and clearly plan. We unite oceans, carry streams over mountains and under rivers, irrigate deserts. There is no reason why we shouldn't eventually bring the water down from the skies, where it often goes entirely to waste in clouds driven out to sea.

Some time ago one man experimented with liquid air from a balloon, thinking that making the clouds cold might cause the rain to fall.

Now Professor Bancroft of Cornell, experimenting with "electric sand," thinks it can be used to dissipate fogs above cities, harbors, flying fields, etc.

A very timid man is not willing to endure laughter, and this writer is willing to admit that for 20 years he has discussed with others, including his patent attorney, the possibility of causing rainfall.

Smile if you will, but this is the plan evolved by your humble servant and roughly presented, with all valuable rights reserved.

Use flying machines of different types, preferably dirigibles, able to carry many tons. As they pass through or above the clouds, scatter in the rear some very finely powdered, thoroughly dried hydrophilous substance. Ordinary lime, such as farmers put on their fields, reduced to a fine powder, might answer the purpose.

The propellers of the flying machines might do the scattering of the dust, which could be expelled through a wide-mouthed vent from a container at a very low temperature, if that be desired. Each microscopic particle of lime, with its great affinity for water, would condense, hold and carry down with it many times its own weight of water. One ton of lime thus scattered in the upper atmosphere would, theoretically, bring down many tons of water in gentle rain. The lime would be good for the ground.

The actual amount of water captured and brought down by the powdered hydrophilous material thus scattered might prove to be only a start, a small part of the total result. Every drop of captured moisture would take down from the cloud a certain amount of heat. It is conceivable that the consequent refrigeration might precipitate natural rainfall. The water above is held in a delicate balance.

You are aware that no drop of rain ever falls to the earth without a minute particle of dust in the center of each drop. If there were no dust in the atmosphere above, there would never be any rainfall. The clouds would drift on, never coming down until they struck a mountainside, condensed, and pour down there.

The fact that every drop of rain must have its central dust speck was first called to this writer's attention in a book by Alfred Russell Wallace, "The Wonderful Century," read some twenty-odd years ago. Since that time the writer has planned vaguely to supply the clouds with the dust that under certain circumstances may be lacking.

Heavy rainfalls after artillery battles have been due, perhaps, to the dust of powder fired into the air from guns and mortars at high elevation. Certain experimenters, mistaking the cause, imagined that a loud noise or explosion could produce rain. Experiments along those lines were tried, without results naturally.

Before the development of the flying machine there was no practical way of getting enough dust up among the clouds. Now the way is open. Perhaps Mr. Wallace, Secretary of Agriculture, who can keep his face straight over queer propositions, will have experiments made and establish their value or foolishness.

It would not cost anything but a few tons of lime, for which the writer will pay if Mr. Wallace will provide the carrying machines.

One hundred to one that there is nothing in it, you say. Very reasonable odds, probably. Nevertheless, any useful thing is worth trying.

If government flying machines, on their errands for the postoffice and other departments, could, in time of drought, distribute lime and rain as they sailed over the thirsty fields, that would suit the farmers.

Men never know what they can do until they try. To talk of taking lime up into the sky to bring down rain may sound supremely foolish now. Not so long ago the idea of flying up into the clouds at all was called a dream.

A fleet of flying machines big enough to carry all the mails and thoroughly protect the country might earn its keep, a hundred times over, by fighting drought while waiting for a human enemy.

Now flying machines are used to spy out forest fires. If this idea, submitted with full realization of the doubtfulness of its value, should prove feasible, flying machines could first find the forest fires, then extinguish them from above, cloud conditions being favorable.

Mr. Brisbane's reputation as an editorial writer is considerably better than his reputation as a scientist, judging by criticisms that have been made of some of his recent writings. However, some enterprising lime manufacturer will probably be willing to contribute a couple of tons of lime if some one will loan a few aeroplanes.

Uses of Pulverized Waste Slate

SLATE is used as a filler in certain paints and distempers, states the Bureau of Mines in Bulletin 218, just issued. The claim has been made that in Wales it has been used successfully in the manufacture of low-grade green bottle glass.

It may be used also as a filler in various other products such as metal polish, abrasive soap, insulators, heavy wrapping paper, and cardboard. Slate dust mixed with some binder, the composition of which has not been learned, is being used in England for molded walls of houses. The dust when properly treated is said to set firm, to be almost impervious to moisture, and to be very durable. Specimen houses have been constructed in Birmingham, England. The main structure of an ordinary dwelling house may be completed in a period of 10 to 14 days at a cost of about half that of brick.

Probably slate dust may be used along with certain types of limestone for the manufacture of portland cement. As slate would constitute not more than one-fourth of the raw material, the location of a cement plant would be governed almost exclusiveiy by the availability of suitable limestone and fuel supply, and by marketing conditions.

The dusting of coal mines with an inert powder to prevent coal-dust explosions is now compulsory in Great Britain, and this supplies an outlet for much slate. In the United States little dusting of coal mines has yet been done. If a demand for inert powder for this purpose is developed in the future the impure slates so commonly associated with coal could probably be utilized to better advantage than those materials which are shipped in from roofing-slate regions.

Pulverized slate has been used with success as a parting sand in foundries, but for such a use a very small tonnage would be required. Slate dust may also be used as a fertilizer filler.

Boosting Agricultural Lime by Direct Mail Advertising

By Clarke A. Richards
Fargo, N. D.

Now is the Ideal Time to Reach the Farmer. Primary Requisites are Accurate Mailing Lists, Knowledge of Local Conditions, and an Intelligent Questionnaire

AT this time of the year the farmer is in a receptive mood. He is not in the rush of harvest, but is pumping himself full of new ideas and pep through his farmer's institutes, short courses, community meetings, etc.

Now is the ideal time to get home your message regarding agricultural lime. The farmer now has time to read your message and is inclined to give consideration to your efforts to help him solve one of his greatest problems.

A warm sales-letter with a ring of frankness, simplicity, and friendliness, written by one who knows his business and understands farmers and the local conditions, accompanied by a bright, snappy circular which tells of the benefits of limestone in pictures, will be appreciated by the intelligent and progressive farmer more than at any season of the year.

Sow the seed of desire for limestone now; take advantage of the missionary work farm institute workers and county agricultural agents are doing for you. The farmer may not want it now, but when he does he will know the merits of your product.

This article deals with (a) methods of securing data regarding local conditions so that sales material can be prepared accordingly; (b) means of securing accurate mailing lists of live prospects for agricultural limestone.

The preparation of circulars, in which there is a story with an appeal, with photos, is important. It is also important that form letters have a real clincher which makes the farmer realize not only the need of agricultural limestone, but that because of favorable freight differentials, mechanical conditions, and chemical analysis, *your* product is the most economical he can use—whether he desires it for winter or spring delivery.

But direct mail advertising, even though the most appealing material is used, is expensive at best unless it is matched with a carefully hand-picked mailing list. While it is true that poor sales-letters are wasted on the best of mailing lists, it is equally true—and more often the case with a specialized product like agricultural lime—that good direct-mail sales material is wasted on an inadequate and poorly classified mailing list.

Accurate Mailing Lists

A general list of farmers will not fill the bill. Too often agricultural limestone producers send advertising material to those who have no need for this agent which is so frequently valuable to their next door neighbor who is not now receiving the message contained in this literature.

How can we eliminate the names of those who have no need of agricultural limestone; those whose farms consist of easily workable sweet soils; those who have already adequately applied lime to their soils, and those who are so biased that it is a waste of time and material to argue with them—how can we secure and include those who should have and who will be in a position to secure limestone?

Local Sources of Information

Obviously, the place to go for this information is the local sources. Ask those who know the local conditions, who know if the farmer needs it, and whether he can or will buy a desirable dust if offered.

The county agricultural agent is a valuable man to get in touch with on any subject dealing with agricultural limestone. He is the one man who can give frank and unbiased information as to whether agricultural limestone or agricultural lime can be more economically used in that particular county because of freight differentials, distance of farms from unloading points, and conditions of roads for hauling at different seasons of the year.

The county farm bureau president and secretary assume the responsibility of co-operation with manufacturers and others when they accept their positions in their organizations. They are of the highest type of farmers, intelligent, fair-minded, and usually eager to extend any co-operation within reason.

This is equally true with officers of community clubs, livestock associations, and other farmers' clubs designed to build up and promote the local welfare of the community.

Moreover, your letter to these men always stands a chance of being read in public meeting; you thereby have an opportunity to secure the cheapest and best advertising on earth—word of mouth. At least, it is always a wise policy to suggest it.

The local banker is usually a good fellow who can give you the names of good live prospects. He is frequently inclined, however, to be a trifle pessimistic, while the local newspaper is inclined to be too optimistic.

Last, but more important than any, is the satisfied user of your product. Do you ever think of frequently jogging his memory regarding the excellent results he has obtained from your lime?

If the user has not had good results, you certainly want to be among the first to know it—for if he has properly applied it, he should have got good results. If he has not, you want a chance to learn why and to correct the cause so that he will become an enthusiastic booster.

Uses of the Questionnaire

The questionnaire to the user will have a twofold purpose. Obviously his neighbors, both the believers in the use of limestone and those "from Missouri" on that subject, are watching the results of your product on his field. Some are beginning to get just a little envious of his good and profitable results. They are live prospects. Your satisfied customer is the man who can furnish you their names. Do you ever think to ask him about it? Do you ask him for photos of the good crops he has grown on limed fields in comparison with untreated parts of his farm?

Satisfied users of agricultural lime are good men with whom to keep in active touch.

Preparing the Questionnaire

The preparation of any questionnaire requires thought. Many questionnaires hit the waste-paper basket because the receiver regards them as a nuisance, a more or less

cheap form of graft, an interference on a busy day.

Why? Usually because of two reasons. First, the sender has failed to realize the importance of sending a letter of explanation along with the questionnaire showing that the entire action is for mutual benefit and co-operation. Secondly, too much is asked for; too many questions are asked; the questions are too personal, or they require too much research and study to answer.

By all means include a letter of explanation. Make this letter short and to the point. Show that you are only seeking information that will solve a problem of vital importance to both the producer and the consumer; that you will furnish the farmer an absolute necessity in the most economical manner, and at a price from which all waste has been eliminated.

Frankly admit that you are ascertaining if in the opinion of local authorities on the subject—the recipient likes to know you value his opinion—your product is the most economical that can be used locally. He may go into the subject in detail, but the main thing is that your questionnaire provides a place for the names of live prospects to be listed, and that if he goes into detail on one phase of the subject he will be equally free in furnishing a goodly number of the names you are looking for. After all, that is what is desired.

Write the letter on plain stationery, with a simple letterhead. Do not include any sales talk to detract from the message you are putting over regarding the mutual benefits to be derived from the questionnaire.

In the letter call attention to the self-addressed stamped envelope in which the questionnaire is to be returned. Be sure this return envelope is a large one. The added material sometimes returned is surprising. Fasten the return envelope to the letter, not to the questionnaire blank.

Common Mistakes in Questionnaires

Profit by the mistakes of others who have sent out questionnaires to farmers. An Eastern manufacturer with his questionnaire enclosed a letter in which he used several technical terms that confused the farmer recipients to such a degree that only a small percentage answered. In fact, the local county agent reported that he was kept busy day and night trying to explain the meaning of the terms to the many who asked him.

In another instance, so many circulars describing the product were enclosed that each of the recipients had to pay 2 cents extra postage. If any enclosures are sent, the number should not be so great as to cause this mistake nor the equally serious error of taking the attention of the farmer from the questionnaire to that of the advertising literature. This material can be sent out at a later date.

Again, a manufacturer wanted to know if there were room in a highly competitive field for a new type of farm lighting plant. He demonstrated the superior merits of his proposed outfit and mentioned the names of the others. In that way he was spending hundreds of dollars keeping the names of his competitors before prospective purchasers and was taking their attention from the questionnaire for which he desired answers.

In letters or enclosures sent out with these questionnaires forget that you have any competitors; forget that there is a controversy regarding the merits of one form of agricultural lime over another. Let the recipients handle that question and then answer their statements at a later date.

The recipient is usually interested in the questionnaire he fills out and returns to you. If you are securing any data which might be of future value to him, his county, his club or his bank, it might be a good plan to offer to send it to him after compilation is completed. For the last question, ask if he is interested in a summary of the data obtained, an analysis of your product, a sample, etc.

Do not make the common mistake of offering pay for this service of filling out the questionnaire. Keep it in the light of co-operation and a favor which you will be glad to repay at any time.

Do not start your questionnaire by asking for the name and address of the farmer. If you desire that, key it in by using numbers on the return envelope or by different colored paper on the questionnaire blank. Much more frank answers will be obtained if the name and address of the sender are not required. If you do include them, place them at the end of the form, and not at the beginning.

Leave considerable space for the answer of each question, with a notation that if there is not enough room, to turn the page over and to use the reverse side.

Limit the number of questions regarding local conditions. Of course, there is considerable that is desirable to know, such as whether there is a local railroad siding storage bin; whether limestone is bought co-operatively; whether it is giving uniformly satisfactory results; whether the roads are always in suitable condition for heavy hauling; whether it is too hilly for winter application; whether farmers favor hydrated lime or limestone, etc. These questions, however, should be confined to the smallest possible space and be as few as possible. A long questionnaire will scare away many an answer.

Leave plenty of space for the names of those who ought to be good live prospects. Combined with an idea of what local sales arguments you will have to incorporate in your direct-mail sales literature. The more of them the better; that is what you are seeking.

Now—when these prospective purchasers of agricultural lime are having their winter breathing spell—is the ideal time to use direct-mail advertising to boost your product; get a real mailing list; fit your sales material to suit conditions as you discover them to be now—not as you knew them six months or a year ago—and get in the game and "hit while the iron is hot."

The full Transactions

of the

National Crushed Stone Association will be published in the March 10 issue of

ROCK PRODUCTS

Dolomite and Magnesite Refractories

BEFORE the best results can be obtained from dolomite as a refractory, certain fundamental data not yet available must be at hand. Since previous work has indicated that highly aluminous fluxes together with a small percentage of the sesqui oxide of iron are the most desirable for the dead burning of dolomite, the problem is being studied systematically at the ceramic experiment station of the Bureau of Mines.

Phase rule diagrams for three component systems are being worked out in order to find the non-slaking areas using varying percentages of the flux. The system has been completed using 10 per cent flux, and it is planned to continue the work using 5, 15, 20 and 25 per cent flux. The aluminous flux used in a bauxitic clay and the iron oxide may or may not have to be added, depending upon the percentage present in the clay.

The material used up to the present has been a dense Niagara dolomite, but a highly crystalline stone such as that obtained near Gouverneur, N. Y., will later be tried out. Using the information obtained from the one diagram already completed, some good bricks have been made, but much more is anticipated after the whole field has been covered.

Compactness and Flexibility Big Features of This Plant

The Ohio Gravel Ballast Co.'s screening arrangement and system of chutes permit the production of practically any desired size of gravel

THIS story describes a sand and gravel plant that can produce practically any size of material desired, in a volume of 4000 tons per day, using equipment with which some companies produce but one-fourth that amount. Having a No. 5 gyratory as its primary crusher and two even smaller breakers as secondary crushing units, the Cleves plant of the Ohio Gravel Ballast Co. is able to accomplish these results.

This plant is on the main line of the Big Four railroad within the Cincinnati switching district, and is two miles from North Bend, the Baltimore & Ohio railroad's connecting point.

The company owns several hundred acres of sand and gravel property, and at present is excavating from a 60-ft. bank approximately 1⅓ miles long. A 51-ton railroad type Marion steam shovel does the excavating. This shovel loads into 6-yd. standard gage Western dump cars, which are hauled in trains of six cars each to a hopper midway of the face. The track extends the full length of the face so that the entire pit equipment may be moved quickly to any point desired.

The 18x20-ft. hopper which receives the raw material from the cars is fitted with bars across it both ways, spaced 12 in. apart to prevent occasional boulde- from passing through to the convey

From the hopper the material is automatically fed to a 30-in. conveyor of 219-ft. centers. This conveyor travels 450 ft.

Housed in one building this plant of the Ohio Gravel Ballast Co. produces 4000 tons per day

Every time one of these steel-lined cars empties, 6 yd. of raw material pass to the conveyor

Empty car storage for 120 cars. The body of water at the right is a reservoir and furnishes all the water for the washing process

per minute and discharges direct into a 60-in., two-section revolving gravel screen equipped with an outer jacket with ¼-in. perforations. Here the material is met by a 6-in. stream of water which forces the ¼-in. and smaller through the perforations. Material passing over this screen is discharged on a section of flat stationary screen having 2½-in. perforations. All stone passing through is chuted to a No. 37 rope-driven Kennedy gearless crusher. All material 2½ in. and over continues by gravity to a No. 5 Allis-Chalmers gyratory crusher set to discharge at 2 in.

By the installation of the 2½-in. stationary screen and the No. 37 crusher the No. 5 crusher is relieved of a large amount of stone that would otherwise be fed into it direct from the primary screen

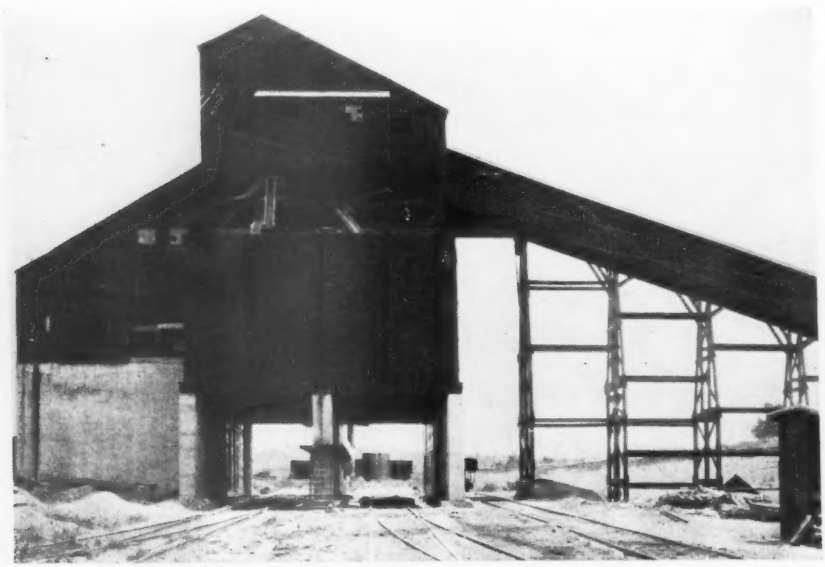
An elevator fitted with 24-in. buckets receives the discharge of the two crushers and elevates it to a double-jacketed, inner barrel revolving screen. Here the gravel is sized and chuted to separate bins. The oversize material from this screen is returned by gravity to a No. 36 Symons disc crusher set to discharge at 1½ in. From this crusher it is chuted into the main elevator and then finally into the sizing screen again.

This standard gage equipment is primarily responsible for the operation's unusual production

The chutes and gates are so arranged under the sizing screen that any combination of sizes and mixtures as well as individual sizes may be chuted to any desired bin. This arrangement permits the company to comply with practically any changes that may be made in state highway or industrial specifications at any time, and without the necessity of shutting down the plant to change the screens or to adjust other equipment.

The sand equipment comprises primarily a large box-type settling tank; 42-in. revolving sand screens, and a smaller box-type settling tank. The larger one receives all material passing through the ¼-in. perforations of the primary screen. By the use of the revolving screens, together with the second settling tank, the production of concrete sand, mason, and "unsplit" sand is possible. The settling tanks are of the company's own design. They are of timber construction, V-shape, with valves at the bottom for withdrawing the sand. Open wooden flumes carry the water to its waste.

Eight bins with a total capacity of 2000 tons provide storage for the washed and



Here four cars may be loaded simultaneously by one man

screened sand and gravel. The entire plant is housed in one building, of concrete and steel construction, with an outside covering of corrugated galvanized iron.

Storage for the loaded cars. At the right is the office

An Allis-Chalmers single-stage pump with an 8-in. suction and discharge delivers 1800 gal. of water per minute to the plant for washing purposes. This pump is direct-connected to an electric motor. Excepting the steam shovel and locomotives, the entire operation is powered by electricity, using a total of 350 hp.

Four side tracks for empty cars provide accommodation for 120 cars. A 1½ per cent grade makes unnecessary the use of a switching engine. Siding space below the plant is adequate for 60 loaded cars.

Although this operation has a rated average capacity of 3000 tons, the company has often loaded and shipped 75 cars, or 4200 tons, in a 10-hr. day. L. J. Adams is the plant manager.

Present officers of the company are, president, M. R. Munson; vice-president, George Lyngst; secretary and treasurer, S. V. Taylor. All are Prairie du Chien business men.

Selling a Sand Product to Farmers

IT may be a little far-fetched to start making concrete products just to be able to market a deposit of good sand you may happen to have, but the principle is sound if there is an ample market to absorb the concrete products at a profit-giving price. This in effect is what the Prairie Concrete Products Co., of Prairie du Chien, Wis., has done.

This company is specializing in silo staves and has been successful in selling some 40 silos to farmers this summer in Wisconsin and eastern Iowa within a radius of 150 miles of Prairie du Chien.

The company was organized with $50,000 capital about four years ago. On a seven-acre tract of land, practically worthless for agriculture, but with a good quality sand for concrete products, the plant was erected. The sand top soil is as deep as 200 ft. on parts of the area.

About 20 men have been employed at the factory this summer. A variety of building units for farm building uses are manufactured. Hog stables, milk houses, poultry houses and foundations for barns and residences are made with units complete to erect the complete structure. With the great amount of dairying that is done in Wisconsin and eastern Iowa, and no other concrete tile plant in the territory, the company will endeavor to popularize its silos particularly as the time seems to have about arrived when every farmer in Wisconsin and Iowa is going to think a silo is as essential on the farm as a granary or corn crib.

Here's the plant which has kept 20 men busy excavating sand and making silo staves to sell to farmers

"Our concrete silo will outlast those built of any other material, they won't rot and they won't burn, we tell the farmers," says George Kahler, foreman of the plant.

The sand is obtained by the use of a dragline operated by gas power and a drum hoist. The factory is electrically operated, and delivers its products by truck over quite a large territory.

Limestone First—Then the Steel

WHEN you mention Bethlehem, Pa., you at once think of steel, and ships, and Charley Schwab. This is the thought conveyed by an interesting article in the September issue of the *Hercules Mixer*.

But before Bethlehem can produce its steel it becomes necessary to obtain the limestone employed as a flux in smelting the iron ore. To tell a reader of Rock Products how this limestone is quarried is "carrying coals to Newcastle" or logs to the forest.

This company, however, does control the manufacture of all of its products from start to finish—and its limestone is produced on its grounds. During one month's production in 1918 it required nearly 50,000 tons of limestone to turn out 95,049 tons of pig iron. In a normal year these plants use about 2,000,000 tons of limestone.

Across the Lehigh river, which runs past the Bethlehem Steel Co.'s plant, is the limestone quarry from which its stone is obtained. And here on a recent occasion a dynamite shot was prepared requiring 51 holes averaging 80 ft. in depth—a large shot.

By the time all was ready a large crowd had assembled to witness the blast. We can always count on the average American citizen to be on hand when there is anything coming off that savors of pyrotechnics. Even Messrs. Wilson and Shainline of the Charles Warner Co. were among those present, as were Manager Jacobs of the Bethlehem and several of the quarry superintendents.

From 7 in the morning until after 6 at night there were the usual preparations for making the shot. And then came the blast when 22,000 lb. of dynamite broke down 83,671 tons of limestone.

Manufacture of "85% Magnesia"

Process Involves Burning Dolomite Limestone and the Separation of Calcium and Magnesium Hydrates by Use of CO_2 Gas

THE BASIS of "85% Magnesia" is an inorganic inert chemical product, a compound of the carbonate of magnesia with the *hydroxide*. It is the "block-magnesia" of commerce, the *magnesia alba* of the pharmacist. Its composition, though somewhat indefinite, may usually be expressed by the formula: $4MgCO_3$, $Mg\ O_2$, H_2, $5H_2O$; this being found to vary slightly with the method of manufacture. It is produced from the rock known as dolomite (magnesium-limestone) which is first calcined and then submitted to a prolonged "slaking" with a large volume of water. The resultant product, consisting of the mixed hydrates of lime and magnesia, is next subjected to a course of "saturation" by carbonic acid gas (a by-product of the process), which dissolves the magnesia, leaving the lime behind.

The diagram herewith illustrates this process in a form that is known to chemists as a Flow Chart—that is, a chart which diagrammatically traces the operations and chemical changes down to the finished product.

This chart also shows the material in the various stages of operation, as well as the finished products and the uses to which these are commonly put.

Dolomite the Starting Point

Following the direction of the arrows it will be seen that the raw material used is that known as dolomite rock, a hard rock which is quarried and which contains about 43% of magnesium carbonate, but mixed with limestone, iron, clay, sand and other impurities. It is the object of the process first to separate the magnesium from the other compounds and then to change it into that light fluffy material consisting of myriads of minute magnesium crystals out of which are built up the dead air cells which so effectively prevent the escape of heat.

This interesting chemico-mechanical process can be easily traced by means of the chart and the large number of treatments necessary to obtain the pure material will be understood.

Asbestos as a Binder

Asbestos, the other component of "85% Magnesia," is obtained from veins which lie in a hard rock and it is necessary to blast out about 100 tons of the rock to obtain approximately six tons of asbestos. The rock must be broken away from the asbestos fibres and these pieces of crude asbestos must be cleaned free of rock, crushed, screened and carefully graded to separate the fibres into grades of various lengths.

The material is next molded into standard shapes and sizes. Drying requires five or six days, because the insulating value of the magnesia is so high that heat cannot penetrate it and drive out the moisture in less time.

Planing the rough molded sections to true dimensions, by special machinery, completes the manufacturing process.

Modern practice, founded on long ex-

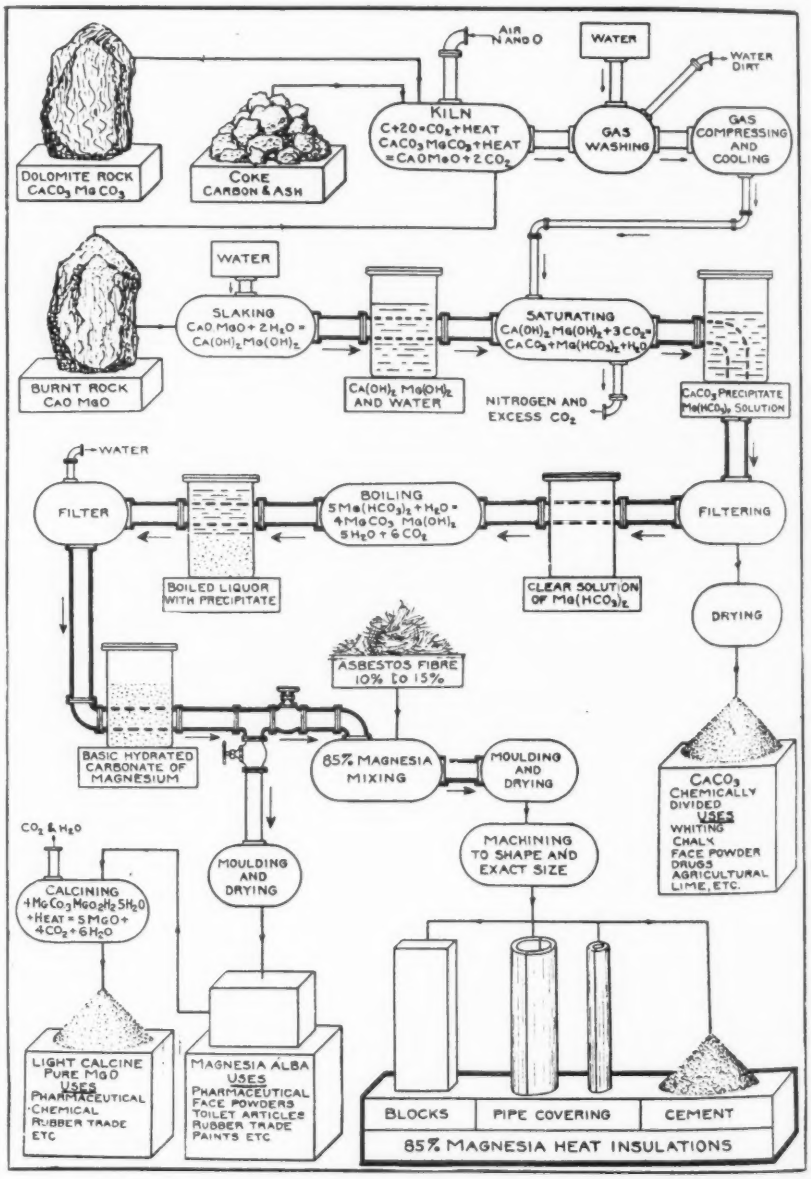


Diagram showing how dolomite lime forms the basis of magnesia pipe covering

* From "Defend Your Steam," published by the Magnesia Association of America, Philadelphia, Penn.

perience, has settled upon the proportion of at least 85% magnesium carbonate with a percentage of asbestos as a binder, as giving the maximum non-conducting power, combined with the requisite structural strength to ensure durability.

Insulating Effect from Air Cells

The "85% Magnesia" heat insulation is essentially a mass of minute dead air cells, formed by the interlocked walls of crystalline flakes of which it is composed. This is the reason for its extreme lightness and for the ease with which it will absorb nearly three times its own weight in water.

It is this dead air structure which gives "85% Magnesia" its remarkable heat-retaining properties. What makes it unique among all materials, natural or artificial, is the fact that no other substance that can be practically used for heat-insulating purposes contains so large a proportion of true, minute, dead-air cells in a given bulk.

Southeastern Aggregate Men Organize

AT a meeting held on February 19 in Atlanta, 215 men, representing the interests of sand, gravel, crushed stone and slag operations of the Southeastern states, assembled and organized themselves into an association under the name Southeastern Association of Aggregate Producers. The territory over which this organization will operate includes all states south of the Ohio and Potomac rivers and east of the Mississippi.

The purpose of the association is to represent the rock products industries of the Southeast in matters pertaining solely to the revision and stabilization of freight rates and to the handling of the car supply situation.

Territories to Be Subdivided by Groups

Under the present plan of operation the entire territory covered by the organization will be subdivided into territories which will be represented by groups of producers rather than by individuals, so that the territories may be classified alphabetically and the producers numerically, thus avoiding all possibility of indiscrimination. The association contemplates an exhaustive study of the various conditions as reported by the individual groups and proposes frank discussions with the railway officials to bring about proper adjustment to the satisfaction of both the producers and the railroads. It was brought out at the meeting that the railroads are in favor of such an organization and that it had been expressed by certain railway officials that they much prefer to take up matters pertinent to car shortage and tariffs with associations rather than with individuals.

Present Plans Outlined

Those present urged to discuss the matter with their fellow producers who did not attend the meeting, and to explain to them that should the association represent 75 to 80 per cent of the tonnage produced in its territory, freight rate revisions would undoubtedly be dealt with to a degree in accordance with the recommendations of the association. This would mean that, although the committee handling such matters would let no opportunity pass to present the individual producer's problems in their relative positions with the railroads, certain unintentional action on the part of the committee might operate an injustice on some producers unless they were aligned with the association and had outlined their individual conditions.

President A. P. Burke

Officers elected at this meeting were as follows: President, A. P. Burke; vice-president, H. B. Springer; secretary-treasurer, J. S. Waterman. The association's temporary offices are at 39 South Forsyth street, Atlanta.

Iowa Stone Products Association Formed

AFTER several attempts to organize the stone producers of Iowa, the feat was finally accomplished by a newcomer in the state, R. N. Van Winkle, who is well known to the crushed stone industry and will doubtless be especially remembered "down in Indiana" as being the prime mover in organizing the Indiana stone men back in 1913. The first organization in Indiana was known as the Indiana Stone Club.

The initial meeting was held at the Montrose Hotel in Cedar Rapids, Iowa, on February 14, at which time the following officers were elected: Paul M. Nauman, vice-president Eagle Point Lime Works, Dubuque, president; Stanley M. Hand, president River Products Co., Iowa City, vice-president; R. N. Van Winkle, general manager Hawkeye Quarries Co., Cedar Rapids, secretary and treasurer.

The Iowa Stone Products Association has two classes of membership; the active members for quarry operators only, while the associate memberships are open to material and supply companies furnishing materials and supplies used in quarry operations. The headquarters of the association for the present will be at the office of the secretary, 210 Second avenue, Cedar Rapids, Iowa.

Secretary Van Winkle is most enthusiastic over the future of the association. To a ROCK PRODUCTS representative he said:

"Well, here we are, all organized and full of pep and ambition. I have had a great deal of experience in association work, and I am sincere in telling you that the boys in Iowa have taken hold of this association like old-timers. I am positive a great deal of good is going to come out of this organization. The stone business in Iowa has been in a chaotic condition and it was high time something was done. Everyone was under the impression that an association could not be formed and all were surprised when the thing was put over as well as it was."

Americans Said to Be After Control of British Cement Industry

A SPECIAL cable report to the New York *Times* from London, February 11, states:

"Notwithstanding professed official ignorance and considerable market skepticism on the matter, there is undoubtedly something behind the report that a strong clique controlled by American interests and backed by United States capital are operating in ordinary shares associated with portland cement. Their object, it is said, is to obtain control, and it is hinted in some quarters they are prepared to go as high as 30 shillings a share to obtain this. It seems a stiff price, when it is remembered that shares are now around 20 shillings."

Production Costs in the Whiting Industry

This is a valuable by-product of the tariff debate found in a report of our National Tariff Commission. The information following is abstracted from that report

AN INTERESTING by-product of the recent tariff debate in the Senate and an example of an intensive effort accurately to appraise competitive conditions within one of our domestic chemical industries are found in an informal report of the United States Tariff Commission addressed to the chairman of the Senate Finance Committee. Some extracts from that report and the tabulated costs of production are presented in the following paragraphs:*

Summary of Conditions in the Industry

The weighted average cost of producing whiting for the first four months of 1922 was $18.47 per short ton. This represents a decrease of nine per cent from the cost of $20.32 in 1921, and an increase of 108 per cent over the pre-war cost of $8.86 in 1914. It was found that the average cost of imported whiting, c.i.f. New York, duty not paid, for the months of April and May, was $12.80 per short ton. This cost for imported whiting, when contrasted with the average domestic cost in 1922, shows a margin of $5.72 per short ton in favor of the imported product. The difference between the lowest domestic and the average imported cost was $3.99 per short ton.

In connection with costs in the domestic industry, the commission must point out the evident lack of labor-saving devices in the grinding of chalk for the production of whiting. The manufacture of whiting is a comparatively simple operation involving the mechanical operations of grinding, floating with water to classify the production into various grades of fineness, filtering, drying and further grinding of the finished product being packed for shipment. From a mechanical engineering viewpoint there is no reason why the product should be handled from the time the crude chalk enters the grinders until the finished product is packed.

The production of whiting is an industry which has been long established in this country, and with a few exceptions there has evidently been a lack of effort to keep labor costs at a minimum by the installation of modern and improved machinery. This statement cannot be applied to all manufacturers, as there are at least two firms which are working along progressive lines to install continuous apparatus which will result in a saving of labor and a reduction in cost. An examination of the costs by companies (Table III) shows that the labor cost ranged from $2.23 to $5.16 per short ton during 1922. From this wide variation it is apparent that certain manufacturers can reduce costs by improved equipment and design of plant.

*Congressional Record, pp. 12, 382-5, Aug. 15, 1922.

TABLE I—COMPARISON OF PRODUCTION AND IMPORTS, 1914 TO 1922 INCLUSIVE

Year	Imports*—Short Tons	Imports*—Percentage of Production	Production, Short Tons
1914	1,181	1.8	†66,000
1915	2,693	.....	.....
1916	1,828	.....	.....
1917	1,074	.....	.....
1918	1,223	.....	.....
1919	765	.....	.....
1920	8,875	.....	.....
1921	8,826	20.6	43,104
1922 (4 mos.)	‡2,379	11.5	§20,766

* Imports are fiscal years ending June 30 for 1914 to 1917 and from then on are calendar years.
† Figure is low, as does not include production of one firm.
‡ Total imports for first three months plus imports at New York for April.
§ Includes production of two firms for 6 months and does not include output of one firm.

A comparison of production and imports of whiting shows that imports have increased greatly since 1919. Table I shows a comparison of imports and production from 1914 to 1922, inclusive. In 1914 imports represented approximately 2 per cent of the domestic production and is not shown in the cost figures, is the service to domestic consumers. The consumer, in dealing with domestic manufacturers, has the assurance that in the case of delivery of inferior goods, immediate and satisfactory adjustment can be secured from the domestic producer, whereas in the case of the imported product it is evident that such adjustment is considerably more difficult. The point at which the price of imported whiting becomes sufficiently attractive to warrant a change from a reliable domestic source to an imported one cannot be measured accurately. For tariff purposes care must therefore be exercised in basing duties wholly on the spread between the domestic cost and the cost of the imported product landed in the United States.

TABLE II—COMPARISON OF THE TOTAL WHITING COSTS, 1914, 1921, AND 1922 (FOUR MONTHS)

(Costs are per short ton)

Period	Production Short Tons	Sales Short Tons	Total Cost	Material	Direct Labor	Factory Overh'd	Administration and Selling	Packages	Net Price Received	Profit
4 months, 1922	*20,766	20,231	$18.47	$7.39	$4.04	$3.87	$3.05	$0.12	$22.78	$4.31
1921	40,019	39,755	20.32	7.02	4.33	4.54	4.27	0.16	24.52	4.20
1914	61,627	62,008	8.86	3.64	1.71	2.17	1.23	0.11	10.65	1.79
			(Percentage of total cost)							
4 months, 1922	.....	.....	$100.0	$40.0	$21.9	$21.0	$16.5	$0.6	$123.3	$23.3
1921	.....	.....	100.0	34.6	21.3	22.3	21.0	0.8	120.7	20.67
1914	.....	.....	100.0	41.1	19.3	24.5	13.9	1.2	120.2	20.20

* Includes production of two firms for 6 months.

Foreign and Domestic Competition

The wide spread between the domestic and imported cost of whiting is in no small part due to existing exchange rates and will decrease as the Belgian and French exchange approaches normal. A factor in favor of domestic product, which prior to 1920 never exceeded 2,700 short tons. During 1920 and 1921 they approximated 9,000 tons per annum, or about 20 per cent of the domestic production during the latter year. A comparison of imports and production for the four months in 1922 shows that imports were approximately 12 per cent of the domestic output. It is apparent that domestic producers since 1919 have received active competition from imported whiting.

Summary of Costs

Table II compares the costs of whiting

TABLE III—DETAILS OF WHITING COST, BY COMPANIES, 1914, 1921, AND FOUR MONTHS 1922

(Per short ton)

Company Number Four months of 1922	Total Cost	Material	Direct Labor	Total Factory Overhead	Administration Selling	Packages	Net Price	Profit or Loss
1	$15.79	$6.55	$2.23	$3.25	$3.56	$0.20	$19.16	$3.37
2	18.74	6.36	5.16	4.23	2.99	*	22.04	3.30
3†	21.89	7.73	3.57	6.87	4.17	‡.45	27.66	2.11
4	17.69	8.62	3.43	3.00	2.03	.61	20.87	3.18
5†	20.41	8.93	4.87	3.78	2.71	.12	26.86	6.45
Weighted average	18.47	7.39	4.04	3.87	3.05	.12	22.78	4.31
1921								
1	17.06	6.17	2.57	3.69	4.44	.19	22.54	5.48
2	22.29	6.18	5.62	5.51	4.85	.13	28.90	6.61
3	24.89	8.90	3.56	8.14	5.00	‡.71	24.26	—.63
4	21.04	9.76	5.39	2.65	2.79	.45	25.08	4.04
5	21.28	7.97	4.89	4.56	3.68	.18	24.72	3.44
Weighted average	20.32	7.02	4.33	4.54	4.27	.16	24.52	4.20
1914								
1	7.96	3.21	1.05	1.88	1.69	.13	10.62	2.66
2	8.74	3.61	1.97	2.21	.93	.02	10.84	2.10
3	9.31	4.16	1.57	2.35	1.19	.04	9.81	.50
4	9.36	4.05	1.76	1.18	1.73	.64	10.51	1.15
5	9.98	3.93	2.12	2.96	.93	.04	12.01	2.03
Weighted average	8.86	3.64	1.71	2.17	1.23	.11	10.65	1.79

* Profit of $30.60 for period on bags. † Costs covering 6 months, 1922.
‡ Indicates profit.

for 1922, four months, with 1921, and the pre-war year, 1914. This table also shows the percentage of total cost represented by the items of material, direct labor, factory overhead, administration and selling, and packages. The total cost for 1922 was $18.47 per short ton. Of this total, $7.39, 40 per cent, was for material; $4.04, about 22 per cent, was direct labor; $3.87, 21 per cent, factory overhead; $3.05, 16½ per cent, administration and selling expenses; and 12 cents, less than 1 per cent, was for packages. The average net price received for whiting during 1922, four months, was $22.78 per short ton. A comparison of this price with the total cost indicates that the industry as a whole made an average profit of $4.31 per short ton, or about 23 per cent of the total cost. The cost for 1922 was more than double that of the pre-war year, 1914. The material cost for 1922 was more than twice that of 1914; direct labor nearly two and one-half times as much; factory overhead about one and eight-tenths times; administration and selling, about two and one-half times the same items in 1914. The average profit per ton of $4.31 in 1922 may be compared with $1.79 per ton in 1914; on the basis of percentage of total cost, however, the profit in 1922 was 23.3 per cent, as compared with 20.2 per cent in 1914.

Table III shows the variation in the cost of whiting according to companies. The costs listed under a given number are those of the same company for the three periods given.

A study of this table shows that the total cost in 1922 ranged from a low of $15.79 per short ton to a high of $21.89, a variation of about 40 per cent of the low cost. The greatest variation in the various items of cost occurs in that of direct labor. This item ranged from a minimum of $2.23 per short ton to a maximum of $5.16, or a variation of about 130 per cent of the low cost. The net price (freights and commissions deducted) received for whiting during 1922 (four months) ranged from $19.16 to $27.66.

This table also shows that the average profit during the four months of the year 1922 ranged from $2.11 per short ton to $6.45.

Details of Cost of Imported Whiting

In Table IV is shown the detail of representative shipments of whiting entered at the port of New York—the point at which most of the whiting is imported—during the months of April and May, 1922. This information was obtained from the original invoices on record at the New York custom house. The shipments included in this tabulation represent in quantity a little over one-third of the total imports — 1981 short tons — at the port of New York for the months of April and May. By far the larger part of the whiting entering the United States at this time originated in Belgium, with France ranking second in importance. Very little whiting was imported from England and Germany.

This table shows that the weighted average cost of 10 shipments of whiting aggregating nearly 700 short tons, was $12.80, c.i.f. New York, duty not paid. This cost may be compared with a cost of $9.36 per short ton at foreign ports packed ready for shipment.

It should be noted that the difference between these two costs is not represented by the items of freight, insurance, consular fees, and other expenses, as it will be seen from the table that these items were not available in the case of all shipments. They are, however, included in the total cost, c.i.f. at New York, in all cases.

A study of this table shows that the total cost at New York ranged from $9.89 to $20.52 per short ton.—*Chemical and Metallurgical Engineering.*

TABLE IV—DETAIL OF COST OF WHITING IMPORTED AT NEW YORK, APRIL AND MAY, 1922

Country of Origin	Quantity (Short Tons)	Cost c.i.f. New York (Without Duty (Per Short Ton)	Ocean Freight (Per Short Ton)	Insurance, Consular Fees, Other Expenses (Per Short Ton)	Cost f.o.b. Foreign Port Packed (Per Short Ton)	Packing Cost (Per Short Ton)
Belgium	143.3	$11.79	$3.04	$0.085	$8.66	$1.99
	104.7	13.27	3.11	*.049	10.11	2.42
	84.0	11.25	2.12	.078	8.03	1.91
	117.6	10.99	2.96	.080	7.95	1.89
	44.8	9.89	2.95	.128	6.81	1.89
	33.1	15.50	3.03	.210	12.25	4.55
	40.5	18.89	3.07	.188	15.63	4.59
Germany	5.5	20.52	2.45	†.428	17.64	3.68
France	110.2	14.36	.....	.....	.....	.....
England	5.7	16.58	3.90	.....	12.68	3.90
Weighted average	689.4	12.80	2.90	.09	9.36	2.39

* Insurance only. † Consular fee only.

Agstone in News Columns of Chicago Daily

UNDER the caption "Limestone Aids Wisconsin Grow More Alfalfa," the Chicago *Tribune* of February 2, 1923, contains the following news despatch:

Madison, Wis., Feb. 1.—Limestone pulverized and added to the soil is adding thousands of dollars to the returns to Wisconsin farmers through increased production and acreage of alfalfa, the extension division of the College of Agriculture declared in its annual report today.

One acre of alfalfa in the Middle West has twice the value of an acre of oats, corn, rye, wheat, or barley, the report said.

Green county has placed 8000 tons of lime on its soil; Iowa county is applying 6000 tons annually and Green Lake county about 3000 tons. Rock county has produced 14,000 tons of lime for fertilizer in the last two years by grinding rock, and Walworth county, just beginning, put 1000 tons on the soil last year.

In many cases limestone fences and buildings are destroyed and pulverized to make fertilizer.

Keeping the Plant Up-to-Date

That's what every manager must do if he's going to make a maximum profit. Here is how one manager is keeping his plant up-to-date

By J. L. Heimlich
President and General Manager, Le Roy Lime and Crushed Stone Co.

NO plant, however well designed it may be in the first place, can expect to continue operating at maximum efficiency without occasional changes in the equipment and possibly in minor parts of the design. The manager who wants to keep his plant operating so as to get the maximum quantity at the lowest unit cost must be always on the lookout for changes and improvements which will bring him those results. We are always trying to find new ways to increase the capacity and the efficiency of our plant.

This last spring we have made an unusually large number of changes, and I believe everyone of these changes has brought a decided improvement in the operation of our plant. The changes we have made may suggest to other managers similar changes in their plants which will improve their operating methods.

I shall relate half a dozen or more of the changes we have made.

Let us begin with the initial crushing operation. We have a 30-in. McCully crusher to which the quarry cars dump direct. One of the illustrations shows a car being dumped, and also the lower end of the conveyor gallery. This initial crusher used to be driven by means of a rope drive from the 500-hp. Corliss engine which formerly drove all the machinery of the plant. This drive at times gave us a little trouble; it seemed to put a little too much load on the driving unit under certain conditions. To avoid this difficulty we have purchased and installed a 150-hp. electric motor, the only duty of which is to drive the 30-in. crusher, and we now have none of the previous difficulties.

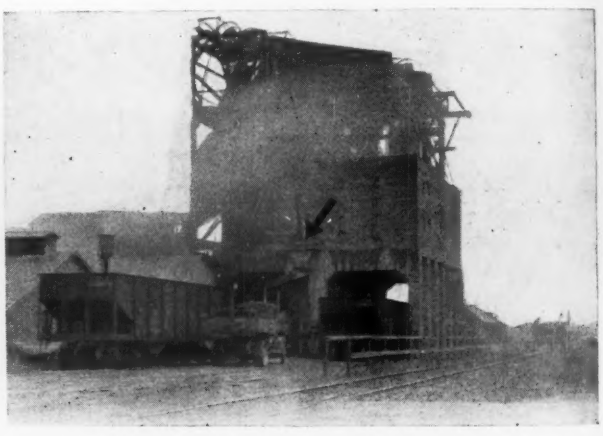
The material from the initial crusher is conveyed on a 48-in. belt of 150-ft. centers through the conveyor gallery and it all used to go direct to a No. 8 McCully crusher for recrushing. This overloaded the No. 8 crusher somewhat, so last spring we installed a Robins rotating grizzly, consisting of seven revolving cylindrical rolls so arranged as to permit material 3 in. and below to pass through. This fine material goes direct into the bucket conveyor, which elevated the material to the screening plant, while the larger material goes into the No. 8 crusher and from there to the scalping screen.

This rotating grizzly is the second improvement we made in 1922, and it has been working very satisfactorily, handling material at the rate of 350 tons an hour.

The next change we have made is in the conveyor from the No. 6 crusher to the scalping screen. Formerly a 42-in. bucket conveyor was used for this purpose, and while the conveyor could handle all the material it frequently spilled stone and gave us more or less trouble. Now we have substituted two belt conveyors to get the material from the secondary crusher to the scalping screen, one conveyor elevating the material through half the distance and dumping on a return belt conveyor, which dumps direct into the receiving end of the scalping screen. We can run the two belts with less power than it formerly took to drive the one bucket elevator and the two belts give us no trouble.

We still use a bucket elevator for conveying the material from the grizzly and the scalping screen into the main screening plant, and while we would spend an hour or more every night cleaning up the spillage under the bucket elevator we have overcome that difficulty by putting a return belt under the bucket elevator which automatically returns all the stone which drops off the bucket elevator and puts it back into the main circuit again. With these belts operating we have practically a self-cleaning plant, and we not only save two or three man-hours of labor each day, but we have a plant which gives always a neat and clean appearance around the con-

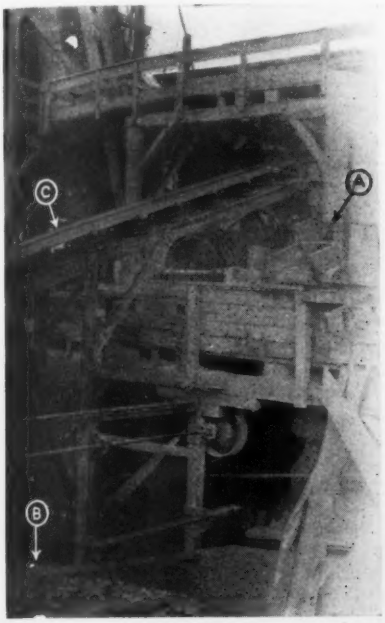
Quarry cars dump direct to the primary crusher, which was formerly rope-driven from a Corliss engine. Now a 150-hp. electric motor drives the crusher, and trouble has been entirely eliminated



The home-made loading chute to which the arrow points speeds up loading when a mixture of two sizes is called for. The article explains how it works

veyors.

Another improvement will give us an additional product which formerly has been waste and which has meant not only loss of material but additional cost in hauling it off and dumping it. This improvement which I refer to is a Tyler electric hummer screen, which will take out from the screenings the material from ⅛ in. to ⅜ in. to be used as an oiling stone or blotter in road construction. Previously these screenings have been an absolute loss to us, but now we have a good market for the oiling stone and we can add to our profits by the installation of this Hummer screen.
installation of this hummer screen.



Crushing capacity has been greatly increased by the rotating grizzly (A). From the No. 6 crusher to the scalping screen the old 42-in. bucket conveyor has been replaced by two belts (B and C), which give much more satisfactory service and require less power

Another device which speeds up our work and gives us more effective mixtures where a mixture of two sizes is called for is a little home-made loading chute shown in one of the illustrations. In the lower adjacent corners of two bins we have put in small sliding doors which open into a single chute and by varying the size of the openings on these two doors we can deliver any desired proportion of the two sizes into the chute and through a spout into the car or truck below which is to be loaded.

Still another improvement which will help us to speed up shipments is the addition of four miles of trackage, which will make our loading more rapid and besides will enable us to classify the cars according to destination in order to get them on their way with less delay.

I have mentioned the new electric motor for driving our initial crusher. This meant that we had to bring in a new power line to furnish power for driving the motor, and instead of the usual overhead line we have placed the electric cable under the ground all the way across our property to prevent any possibility of accident to the cable from blasting or any other cause. With a 2200-volt line, it is evident this precaution is likely to save us a great deal of trouble.

These are some of the more important of our recent changes. No doubt another year will see still more improvements which experience will have suggested. If the passing on to other operators of these changes which our experience has shown to be wise helps some other manager, we shall be glad to have been of assistance. We believe in the exchange of ideas, and we feel that we can learn as much from other quarry operators as others may be able to learn from us.

Slag Association's Cleveland Meeting

THE fifth annual meeting of the National Slag Association was held at the Hollenden hotel in Cleveland, Ohio, February 16.

A. T. Goldbeck, chief of the Division of Tests of the U. S. Bureau of Roads, who was present at the afternoon session, discussed with the producers the elaborate test procedure of the complete investigation of the properties of slag as an aggregate in concrete, which his organization has practically completed. The work was begun in 1919. In all probability, the results will appear as a paper before the American Society for Testing Materials in June of this year.

H. J. Love, Secretary, the National Slag Association

Approximately 85 per cent of the tonnage of commercialized blast furnace slag is represented by the membership of the association.

The following officers were elected for 1923:

President, C. L. McKenzie, Duquesne Slag Product Co., Pittsburgh, Pa.; Vice-President, C. E. Ireland, Birmingham Slag Co., Birmingham, Ala.; Secretary-Treasurer, H. J. Love, 933 Leader Building, Cleveland, Ohio.

Profits of the U. S. Gypsum Co. in 1922

THE income of the United States Gypsum Co. for 1922 after all charges, including depreciation and taxes, was $3,119,033, equivalent, after preferred dividends, to 64.74 per cent or $12.94 a share on the $4,172,140 of common stock outstanding during the year. On December 31, last, the stock was increased 10 per cent through the payment of a 10 per cent stock dividend.

The earnings figures were made public at the annual meeting of stockholders by President S. L. Avery. They compare with a net return of $2,247,325 in 1921, a rate of 44 per cent, or $8.80 on the common. The book value of the stock, Mr. Avery stated, has increased from $36.95 a share in 1921 to $45.35 at the end of 1922.

Gross sales in 1922 were $19,630,013, an increase of 44 per cent, compared with 1921. During the year, $1,708,000 was appropriated from earnings for additions to plants. The company has $367,921 cash on hand and $503,969 invested in U. S. treasury certificates. Net working capital as of December 31 was $1,139,000.

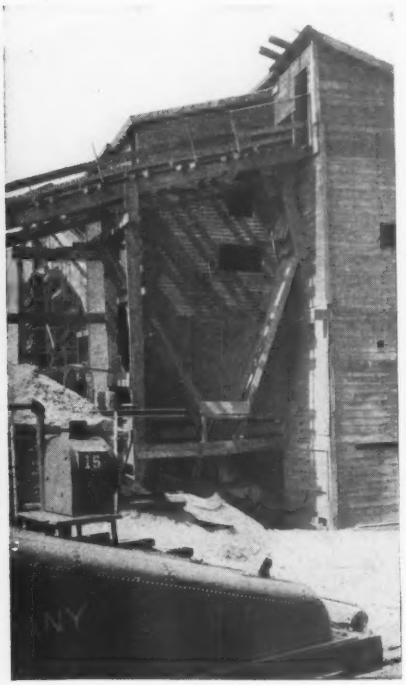
At the annual meeting of the stockholders the retiring board of directors were re-elected and H. E. Brookby elected to succeed F. L. Kane, whose death several months ago left a vacancy on the board. Directors immediately following re-elected present officers of the company and declared the regular quarterly dividends of 1 per cent on the common and 1¾ per cent on the preferred, payable on March 31 to stock of record on March 15.

Hints and Helps for Superintendents

Trapping the Belt-Spill

AT the Consumers Co. plant in Beloit, Wis., they believe in neatness. Not only that, but they have taken steps in a number of places to make neatness practically automatic.

One of these places is under the head pulley of the conveyor belt, which discharges into the scalping screen. Sand and gravel on this belt are frequently sticky, and to play a stream of water on the under side of the belt as it comes over the pulley, as is done in some places, would require considerable construction to care for the wash water introduced.



The V-shaped runways trap sticky gravel dropping off the under side of the initial belt and put it back in the circuit by means of the secondary belt coming from the crusher

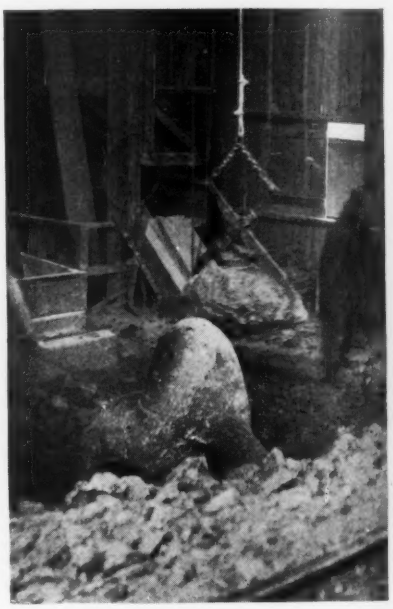
So instead of this method, or of the revolving brush method sometimes used, the sticky gravel is allowed to stick until it is ready to fall off the under side of the belt, and then it is caught and returned to the initial belt by the secondary belt which forms the closed circuit from the crusher for oversize back to the initial belt. All that is necessary for this trap is a few boards to construct the inclined runways shown in the accompanying illustration. Most of the sticking gravel will drop off the belt in the first 20 ft. from the head pulley, and this is chuted down the runways to the belt which carries the crusher discharge back to the initial belt.

This prevents the sand and gravel which drop off the belt in this way from making the plant always untidy. Another place where the plant is kept cleaner than usual is in the crusher room, where the crusher and the runway to it from the scalping screen are completely covered with canvas, to keep stones from flying about the room and covering the floor with dangerous pebbles.

Tongs to Keep the Hopper Clear

BRIDGING and sticking have to be overcome in the feed to pressure types of crushers—jaw or gyratory—and a common method of preventing blockades in the gyratory hopper is by means of a hook suspended by cable or chain and operated by compressed air. Hooking the rock that causes the jam and elevating the cable will usually lift the rock and overcome the jam.

A little different method is used at the Mayville, Wis., quarry of the Steel and Tube Co. of America. Here a pair of tongs is suspended from an air-operated cable. When a stone large enough to cause a jam is dumped into the crusher hopper it can be lifted out of the way with tongs until the smaller material has passed the crusher, then it can be lowered to the hopper and crushed without causing difficulty. If a stone too large for the crusher to take gets into the hopper it can be lifted out and disposed of with the tongs.



These tongs to prevent bridging have an advantage over the plain hook more commonly used

One Way to Advertise

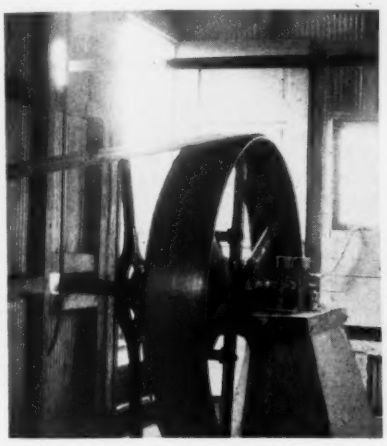
WHEN you're delivering a clean, well-graded, and good-looking product in a sturdy-looking truck, there's no harm in telling other people where it came from. The trucks which deliver sand and gravel from the Consumers Co. pit at Beloit, Wis., after loading, are supplied with an attractive card with the name of the company and "washed gravel from the Beloit pit" printed on it.

When the truck is loaded and ready to go, an employe sticks the poster into the load and the company gets the advertising benefit

A supply of these poster cards made up and ready for instant use are kept on hand. They are arranged by placing back to back two of the printed cards, and attaching them to a stick three or four feet long which can be quickly placed in the load of gravel when it has been loaded and weighed. The accompanying illustration gives a small idea of how attractive as an advertisement this card, which is printed in colors, can be.

Clutch Controlled Conveyor

AT the average plant where conveyors are employed, it has been the general practice to have the conveyor driven by an individual motor, usually of variable speed, or, if the operation is not electrically equipped, it is driven from a shaft from

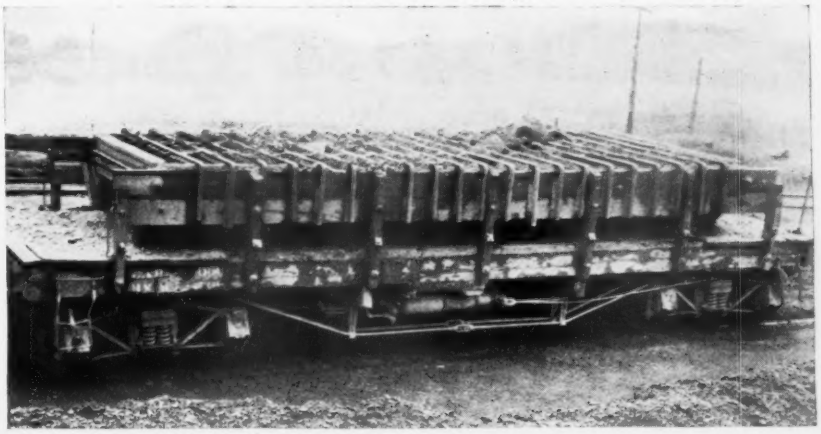


The clutch control lever extends through the building so that it can be operated either inside or outside

which other units are driven. Also, in many cases, a conveyor is one of several units driven by one motor. In the most modern plants, however, it is not uncommon to see the most important units driven separately.

The L. E. Smoot Sand and Gravel Co., Washington, D. C., has in use in its storage yard a 24-in. conveyor of 393 ft. centers which carries as an average load 200 tons of material per hour. Power is supplied by a 40-hp. motor, belt connected to a 60-in. pulley and from the pulley shaft the conveyor is driven by chain belt. To effect a quick stoppage of the conveyor, the company has installed a clutch on the shaft of the driving pulley so that the conveyor may be stopped instantaneously.

As the motor and driving pulley are mounted within a house on top of the storage bins, a lever extends through the building so that the operator outside may start or stop the conveyor whenever necessary with no loss of time.



By having the pit cars equipped with bars across the top, the usual delay at the receiving hopper is eliminated

Grizzly on Sand and Gravel Pit Car

BY equipping its cars with grizzly bars, the Massaponax Sand and Gravel Co., Fredericksburg, Va., has found that its operation can function faster and more systematically than by having the receiving hopper fitted with bars. This company, however, uses a center-dump car and it is unlikely that the same would hold true if the system were applied to side-dump cars.

The cars are provided with rails placed crosswise spaced 10 in. apart and bent down and made fast on the side of the car.

Prior to the use of this method of eliminating oversize boulders, much time was lost in dumping a train of cars caused by oversize boulders becoming foul in the bars of the hopper so that the car could not be moved until the stones were removed. This necessitated an extra man at the hopper to help remove the oversize. With the cars equipped with bars, all oversize material is left at the pit, being removed from the car by a pitman rather than at the hopper by an extra laborer.

The lever extending from the house is within reach of the attendant on top of the storage, so that the conveyor can be started or stopped instantly

Unique System for Signaling from Material Tram Car

IN order to signal to the hoist house from any point on an inclined tramway used for the transportation of material in the construction of the Pit river power plant No. 1 in California, a unique and efficient method was employed by the Pacific Gas and Electric Co., says *Engineering News-Record*. A signal was sent over a pair of wires by bridging them with a signal pole, completing the circuit, and ringing a bell at the hoist house, thereby notifying the engineer.

The signal consisted of a 10-ft. pole carrying a hinged metal arm for bridging the two wires, the hinged feature allowing shorting of the circuit regardless of what position the operator might be in. The signal wire was always accessible to the signal man who rode on the tram car.

The tramway paralleled the penstock line and was about 2000 ft. in length. The car was operated by a cable and electrically driven hoist. It hauled pipe for the penstock, cement and reinforcing material.

Southern Producers Enthusiastic Over Outlook

Extensive Road-Building Programs in the Southern States Warrant This Finding by a "Rock Products" Editor

By George M. Earnshaw
Associate Editor, Rock Products

AT practically all of the operations I have visited enroute from Washington to Chattanooga, coming by way of Fredericksbury, Richmond, Roanoke, Pembroke, Raleigh, Columbia, Asheville and Knoxville, I have found a general feeling of optimism for the approaching season in all branches of the rock products industry.

To say that this feeling merely exists is an incomplete statement, for it is reflected everywhere in the reconstruction and remodeling of old plants and the erection of new ones. Enlarged quarries and pits, additional digging equipment and increased plant capacities seem to be the aim of all of the producers in this section.

Whether Dr. Coue has concentrated on these men I don't know, but it is certainly apparent that "day by day, in every way, their plants are becoming better and better." This means that they do not intend to be caught napping and that they are going to be in a position to supply the road builders with what they want and when they want it.

Many Improved Roads This Year

That the good-roads fever has attacked the South is evidenced in every section I have visited. While at Roanoke I attended some of the meetings of the annual convention of the Virginia Good Roads Association, and was pleasantly surprised at the enthusiasm shown. Rather than a state convention, the meetings more closely resembled those of a national convention, both from the attendance and the go-get-it standpoint. The results of this meeting certainly indicated that Virginia will actually go through with her $12,000,000 road program. The same spirit is much in evidence in the Carolinas and in Tennessee.

National Associations in Favor

Crushed stone, sand and gravel and lime producers particularly, throughout the sections I have visited, are appreciative of the accomplishments of their respective associations. The sand and gravel men have been relieved considerably during the car shortage through their united efforts and seem to be confident that with a continued, concentrated drive in that direction, together with the launching of a general educational campaign promoting the use of clean and graded material, they will enjoy one of the most prosperous seasons in many years.

Crushed stone men are especially enthusiastic since their trip to the Chicago convention. From a talk with M. P. Kenney, secretary of the Gager Lime and Mfg. Co., Sherwood, Tenn., I obtained an insight in what the average producer thinks of associations of the rock products industries. This was the first stone convention that Mr. Kenney had attended and he says he had never realized that the stone industry was nearly so large and so important as that convention made clear to him.

"Why, young man, ten—yes, five—years ago, I was ashamed to admit in certain circles that I was in the stone and lime business. But going up there to Chicago and meeting all those fine, prosperous, and honest-to-goodness men gave me an entirely different idea about it, and I came back here congratulating myself that I am in the business."

Not only the stone, sand and gravel and lime men, but the slag producers as well are conscious of the needs of their association. Since this commodity is comparatively new it is meeting with strong opposition, so that it is necessary for producers to go in strong with an educational campaign directed chiefly at engineers and architects.

Cost Accounting Systems

At Richmond I called at the main office of a large slag company and learned that it is still necessary for them to use literature authorized and compiled by the association, to sell their product.

It is highly probable that the attention this subject has recently received at the numerous conventions has caused many operators to wonder whether they actually have a complete and thorough cost-finding method. At a few of the operations I have visited it was pitiful to learn that they only had approximate figures as to their costs, based only on the figures of their payrolls. But these operators were anxious to learn a thorough method and I hope that some of the ideas I was able to give them, obtained from some of their more fortunate brother operators, will be of material assistance, for, as Mr. Dann said at the recent annual sand and gravel convention, "The only person who profits from a man selling below cost is the sheriff."

Cement Outlook

That the cement industry in the South is going to enjoy a prosperous year is evidenced in the same way as other rock products materials. Consumption in this section has always been far in excess of the production, so that manufacturers may rightfully look forward to a continued prosperity. Even with three new plants in the course of construction — one at Birmingham, one at Nashville and one at Chattanooga — it is hardly likely that even then the plants of the South can take care of her consumption.

Bauxite in 1922

THE domestic production of bauxite in 1922 was at least twice as large as in 1921 and may reach a total of not less than 300,000 long tons, according to James M. Hill of the United States Geological Survey. This quantity is about half of that normally consumed, yet the increase in output is encouraging, for it reflects a larger demand by all the consuming industries, particularly the abrasives industry. The operations in the Arkansas and Eastern fields were larger, though in Arkansas car shortage in the fall limited to some extent the production.

During the first six months of 1922 the imports of bauxite averaged about 1,500 long tons a month, but since June they have been more than 3,000 tons. The prices of domestic dried bauxite ranged from $6 to $10 a ton, but were lower in the last half of the year. The prices of pulverized and dried bauxite have ranged from $12 to $15 a ton, and the calcined from $20 to $25. The effect of a shortage of coal is reflected in an increase in the price of calcined bauxite during the later part of 1922. Under the new tariff the duty on bauxite is $1 a ton, whereas under the old tariff it was on the free list.

Why Cement Should be Moved on All-the-Year-Round Basis

With the Approach of the Building Season, This Problem is Most Pertinent to All Concerned in the Building Industry

DIFFICULTY in securing cement through the summer and fall of last year was due not only to the coal and railroad strikes, but to other reasons that applied last year and in many previous years, declares Blaine Smith, general manager of the Universal Portland Cement Co., according to the Duluth *News-Tribune*.

Purchasers demand large shipments of cement in summer and fall and decline to take deliveries in the winter and spring. As a result cement mills are idle or run only part time in the latter season and are unable to produce enough to supply the demand in the former season.

Transportation usually is available in winter and spring, while the railroads are congested in summer and fall. Obviously the cement user's remedy is to order out shipments when cement and transportation to move it are available.

The cement manufacturing capacity of the country is from 130,000,000 to 140,000,000 bbl. a year. The country fails to use as much as 80 per cent of its manufacturing capacity, even in a year of abnormal building activity, because, to a large extent, cement is considered a seasonal product.

Mills, therefore, manufacture and store large quantities of cement in the off season to be able to ship more than can be produced in the busy season. One manufacturer with a mill capacity of 12,000,000 bbl. a year, had in storage the latter part of April more than 4,000,000 bbl. or over a third of a full year's output. This practice, of course, involves a very heavy investment by the manufacturer which of necessity is reflected in the price of his product.

Aside from this important feature, there is another of equal importance. The average cement mill operating at capacity will fill its storage space in about three months if it makes no outgoing shipments. All mills, of course, make some shipments in all months of the year, but shipments through the winter and early spring are usually so light that the storage bins become full, necessitating curtailment of production. In a year of ordinarily heavy demand for cement, production lost by a cement mill in the early months is lost forever.

To illustrate: A mill with a producing capacity of 12,000,000 bbl. a year can produce 1,000,000 bbl. a month—and no more. If it loses a month's production from any cause it cannot in the next month make up the loss by producing 2,000,000 bbl. In 1922 one manufacturer lost upward of 750,000 bbl. of production in August and September because of the coal strike.

When this manufacturer's mills later began to receive sufficient coal for full operations the mills could not make up the lost production because even at full operation they were not capable of turning out more than 1,000,000 bbl. a month. Their shipments were 2,000,000 bbl. in July and nearly as much in August, although in the latter month a large part of their producing capacity was shut down because of lack of coal. The heavy shipments were made from stocks produced in earlier months.

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All this means that while the capacity of the country's cement mills is more by 20 or 30 per cent than the country has ever used it is impossible to untilize it.

Regulation of Production

Regulation of production is most important in its effect on the cement purchaser who, unable to secure all the cement he wants in the late summer and early fall months, forms the opinion that the cement manufacturing capacity of the country is insufficient to supply the country's needs. That opinion is incorrect, as demonstrated by the Geological Survey's figures.

The most important feature entering into the situation is transportation. It is a well-known fact that in years of even normal business activity the railroads have difficulty in late summer and early fall in moving the traffic offered them, and in years of more than normal business activity the transportation system suffers an almost complete breakdown. In these conditions, it is clear that cement users cannot hope for as prompt deliveries in the late months as in the early months of the year. Yet they insist on demanding heavy shipments in summer and fall when deliveries are difficult to get because of lack of transportation facilities, and decline to take deliveries in winter and spring, when transportation is available.

Realizing the situation as affected both by production and by transportation, the Illinois State Highway Department is incorporating the following provision in its contracts with contractors who are to build roads in 1923:

Storage of Cement—It is understood and agreed that the contractor shall store during the months of January, February, March and April, 1923, not less than 33⅓ per cent of the total amount of cement needed to complete this section, and that this rate of storage shall be maintained until the completion of the work, or until the end of the construction season of 1923.

Terms Laid Down

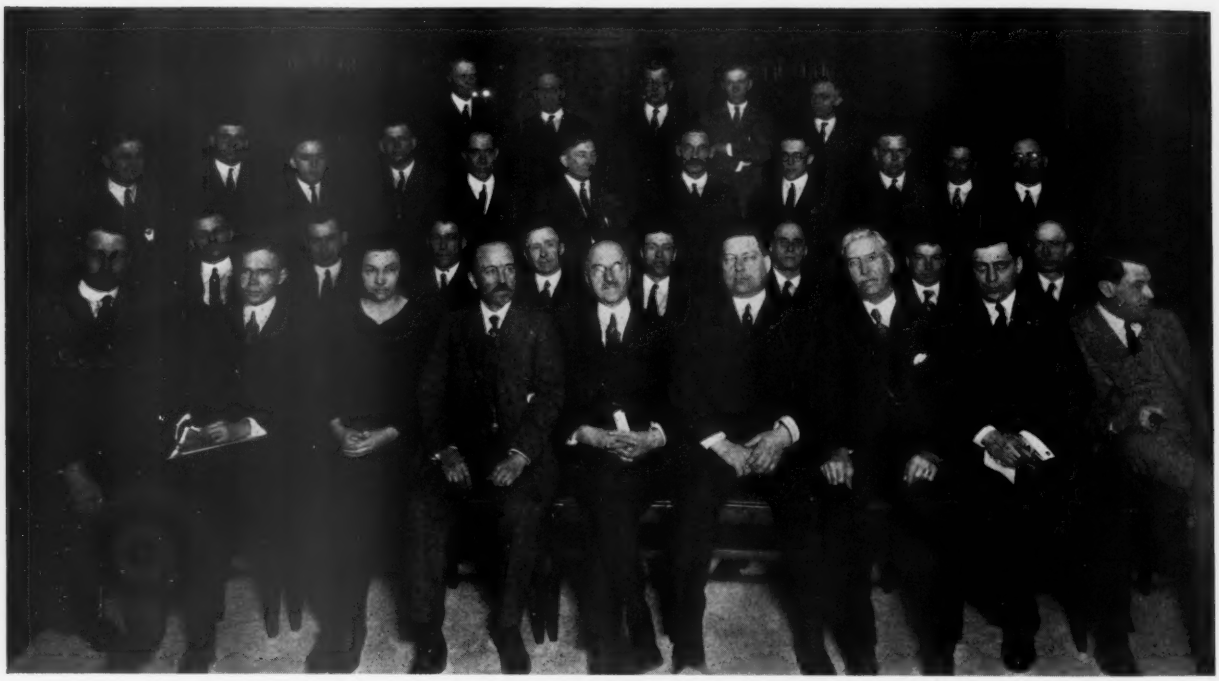
Indiana also is incorporating a similar provision in its agreements with contractors. The highway departments of these two and other states have learned from bitter experience that they and their contractors cannot hope to carry out their extensive highway building programs each year if they insist on trying to confine shipments of cement to the five months, June to October inclusive, and decline to take out any cement in the remaining seven months.

Nor can the state highway departments alone, even if all the other states follow the lead of Illinois and Indiana, provide all the relief necessary. They can improve the situation vastly, but not relieve it entirely. The help of all other cement buyers also (dealers, railroads, industrial plants, contractors on both public and private work, all branches of federal, state and municipal government, etc.), is needed.

Existing cement mills are amply able to supply the country's needs but they must be allowed to ship their output with some degree of regularity through all the months of the year. If more cement mills are built to supply the peak load in five or six months and remain idle or partly so in the other six or seven months, it is inevitable that the price of cement will be higher than if the industry were conducted on a more business-like basis. A mill running only part time cannot produce cement as cheaply as one operating continuously. The excess cost must be passed on by the manufacturer to the dealers in and users of cement.

Co-operation and Good Fellowship at Sand-Lime Brick Convention

IT is believed that the nineteenth annual convention of the Sand-Lime Brick Association, held in Detroit, Mich., on February 8 and 9, will go down in its history as one of its most successful meetings. And not only was this so from the standpoint of attendance, the papers presented, and the number of new members admitted, but also from the spirit of co-operation and good fellowship which prevailed throughout the two days' meeting. There is every indication that there is a very prosperous future for sand-lime brick.



At the nineteenth annual convention of the Sand-Lime Brick Association, held at Grand Rapids, Mich., February 8 and 9

The sessions were held at the Hotel Rowe club rooms. The first morning session was given over to enrollment, the president's message, the secretary-treasurer's report, and the appointment of committees.

As President Jackson was unavoidably absent, his letter to the convention contained the following:

Members of the Sand-Lime Brick Association:

I had planned on being with you at this time, but will be unable to do so on account of having my plans changed, not being able to get transportation as I had expected. I am sorry that I can not be with you, as I enjoy meeting each and every member of the association, having attended all but two of the meetings since our organization. The first on account of being confined to my bed with the grippe—and this my second offense.

This has been a strenuous year for your secretary and president. Having so much new work, together with the lack of co-operation from our members, makes it much harder. I hope that the members will be more prompt in answering letters hereafter, as I have not heard a word from some of them since our last annual meeting. Each member has had from four to at least a dozen letters. This is very discouraging when you try to do the best you can.

I do hope that all of the members present and those reading my message will help the new officers in making this our greatest year, both in the work done by the association and its members through their individual plants. It is necessary that we have co-operation and that we all work together, as the fight of our competitors is still going on.

It was my intention during the year 1922 to visit most of the plants, both in the United States and Canada, but on account of the illness of one of my partners it was not possible for me to get away as I had planned. I made one trip North and West, stopping at Clayton, Iowa, to give them such information as I had regarding their rod mill, which I find was of vast benefit to them. I also stopped at the Belt Line Brick Co. plant, and had a very pleasant visit with Mr. Chandler and Mr. John Zellie, the superintendent. They were operating to full capacity, making more than 72,000 brick each day, with from 34 to 36 men on the pay roll; this I considered very good.

I also went to Winnipeg, calling on our friends D. D. Wood and Hugh Sutherland. I cannot help but dwell on my visit there, and wish that there were the same feeling and harmony among all of the manufacturers of our product that I found while in Canada. I called on Mr. Wood in the morning. Their product, by the way, was as good as I found anywhere in the States.

I complimented Mr. Wood on the nice brick he was making. He stated he did not think that they were quite as good as his friend Mr. Sutherland was making. I afterward visited Mr. Sutherland's plant and he stated the same thing about Mr. Wood's brick. They were making the best red brick that I believe I have ever seen anywhere. They were piled flatwise and the buildings that are built from them are a credit to any community.

On account of the little time I have, and not being able to work as many hours as I have been doing, it will be impossible for me to accept the position as your president another year. I wish to thank those members who co-operated with your offi-

cers in doing the best we could in making our association a success, and I do hope that you will make it easier for the new officers you elect.

At the afternoon session, I. G. Toepfer, the Acme Brick Co., Milwaukee, read a paper on the results obtained with the new equipment at the Acme factory. "High Labor Turnover" was the title of the paper read by J. M. Zander, the Saginaw Brick Co., and "Common Labor Shortage," by W. H. Crume, Crume Brick Co. At 4 o'clock a visit was made to the Grande Brick Co.'s plant.

Friday Morning Session

At the Friday morning session, Robert Marshall, of the Canadian Inspection and Testing Laboratories, Toronto, Ont., read a paper on "Influence of Lime on Cement and Mortar." Other papers were: D. D. Wood, Wood Brick Co., Winnipeg, "Sand-Lime Brick Situation in Canada;" "Freight and Transportation," by J. S. Palmer, Sebewaing Sandstone Brick Co.; "Freight Rate Charges," by John Graham, Jackson, Mich.; Report of Committee on Tests and Standards, by W. H. Crume, Crume Brick Co., Dayton; "Cinder Brick," prepared by the Sheehan-North Co., El Paso; "Just from South America," by Warren E. Emley, Bureau of Standards.

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The concluding afternoon session was devoted to unfinished business, committee reports, election of officers, and a round-table discussion led by W. K. Squier, of the Paragon Plaster Co., Syracuse, N. Y.

Election of Officers

The officers elected for the coming year are:

President, J. Morley Zander, Saginaw Brick Co., Saginaw, Mich.; vice-president, H. W. Terry, Toronto Brick Co., Toronto, Ont.; secretary, J. S. Palmer, Sebewaing Sandstone Brick Co., Sebewaing, Mich.; treasurer, Allen Walton, Jr., Hummelstown Brownstone Co., Hummelstown, Pa.

NEW MEMBERS

The new members are: Sutcliffe Speakman Co., England; Rochester Sand and Brick Co., Detroit, Mich.; Michigan Press Brick Co., Detroit, Mich.; Sand-Lime Products Co., Detroit, Mich.; Boice Bros., Pontiac, Mich.

THE REGISTRATION

I. G. Toepfer, C. A. Wendt, Acme Brick Co., Milwaukee; J. S. Palmer, Sebewaing Sandstone Brick Co., Sebewaing, Mich.; M. L. Phelps, J. D. Wallace, Flint Sandstone Brick Co., Flint, Mich.; T. C. Myer, Menominee Brick Co., Menominee, Mich.; W. R. Dall, North Indiana Brick Co., Michigan City, Ind.; D. D. Wood, Wood Brick Co., Winnipeg; J. Morley Zander, Saginaw Brick Co., Saginaw, Mich.; W. K. Squier, Paragon Plaster Co., Syracuse, N. Y.; Richard Kleinknect, C. M. Hassenloph, Buffalo Sandstone Brick Co., Buffalo; W. J. Carmichael, H. G. Carr, American Brick Co., Boston; Warren E. Emley, U. S. Bureau of Standards, Washington; J. W. Van Brunt, E. D. Church, Jackson & Church, Saginaw, Mich.; William McKay, Richard Kolet, Bernard Elsner, Clayton Brick and Tile Co., Clayton, Iowa; H. O. Joseph, Grande Brick Co., Grand Rapids; W. H. Crume, Robert Kiser, Crume Brick Co., Dayton, Ohio; G. A. Taylor, Sand-Lime Brick Co., Detroit; J. W. Hasse, Rochester Sand and Brick Co., Detroit; G. A. Roller, Michigan Press Brick Co., Detroit; Mr. Rarcy, Marble Cliff Quarries Co., Columbus; Allen Walton, Jr., Hummelstown Brownstone Co., Hummelstown, Pa.; H. W. Terry, H. Race, Toronto Brick Co., Toronto, Ont.; E. C. Johnson, Marathon Mill and Machinery Co., Champaign, Ill.; R. N. Schmoll, Mississippi Marble Co., Alton, Ill.; Roy M. Singer, "Rock Products."

Death of Milton F. Williams

GENERAL regret was expressed on the announcement February 8 that Milton F. Williams, president of the Williams Patent Crusher and Pulverizer Co., St. Louis, died at his home in that city after an illness of 18 months. Mr. Williams was widely known among the manufacturers of the country as the inventor of

Milton F. Williams

the hinged-hammer principle of crushing, grinding, and shredding in 1895. In 1897 he incorporated his machine works under the present name.

The products of this firm are sold in many foreign countries. During the World War the government placed this company on the preferred list as an essential industry.

In the past 10 years Mr. Williams had derived considerable pleasure in gathering data for "The Williams History," a genealogical history of his family and an account of the growth of his business. This was published and printed at his own print shop for private distribution among his friends, relatives and for deposit in various historical societies and mercantile libraries.

He came to St. Louis more than 50 years ago and started in as a millwright in a small machine shop. He is survived by a widow, three sons—Milton Judson of Chicago, Arthur F. of Clayton, Oliver J. of San Francisco—and a daughter, Mrs. Edgar M. Carson of St. Louis.

Anaconda Phosphate Beds

GEOLOGICAL investigation and mapping by the United States Geological Survey of the Idaho bureau of mines and geology have proved that Idaho has a mineable reserve of commercial rock phosphate in excess of 5,500,000,000 tons. This deposit is larger by far than any other known deposit in the world. A bulletin describing these deposits from every angle is shortly to be published by the Idaho bureau of mines and geology.

The most notable development of the Idaho field is the project of the Anaconda Copper Mining Co. This company entered the field early in 1920 by acquiring large phosphate reserves from the California Orange Grove Fertilizer Co., which had large patented holdings near Soda Springs in Caribou county. The Anaconda company has built an eight-mile railroad from Soda Springs to its deposits and founded the town of Conda, made up of the homes of workers at the mine. A notable feature illustrating the magnitude of the Anaconda development is a two-mile crosscut tunnel that is 9x9 ft. in the clear. A track laid with 60-lb. railroad steel, carrying a 15-ton storage battery motors and a string of 10-ton steel dump cars, connects the deposits at the face of the tunnel with the bins, crushers and driers outside.

Two limbs of the folded phosphatic anticline are cut by the tunnel, thus permitting four drifts in the phosphate beds and providing for a production of 3,000 tons per day. Several bins are included in the plant, ore being of 3000 tons capacity; two 500-ton units of the milling plant handle present production, but more are to be added as it increases.

The Anaconda company ships its phosphate rock to its plant at Anaconda, where it uses its surplus sulphuric acid obtained from smelter fumes to acidulate the phosphate. A triple super-phosphate fertilizer is produced containing 48 per cent soluble phosphoric acid.

New Cement Plant in Colorado

ANNOUNCEMENT that the Colorado Portland Cement Co. will operate in Loveland, Colo., a cement plant costing $1,500,000, was recently made by R. J. Morse, general manager of the company, according to the *Denver Post*. The plant will employ approximately 300 men, entailing a pay roll expenditure of $100,000 a week.

Cement Statistics for January

THE Portland Cement Association has decided to disseminate such data as it can collect and augment it with estimates where necessary. It will be noted in connection with the attached report for January that although returns from several mills had to be estimated, there were a number of districts for which the data were complete.

During January, says F. L. Page, statistician, the mills of the country apparently operated at about 65 per cent of capacity with a total estimated production of 7,657,000 bbl. of finished cement, which is the largest output for that month on record and nearly 80 per cent greater than a year ago.

Shipments, which were much heavier than in any preceding January, amounted to 5,550,000 bbl., an increase of 89 per cent over January, 1922. Thus stocks of finished cement in manufacturers' hands increased approximately 2,100,000 bbl. and at the end of January stood at 11,285,000 bbl. compared with an average of 10,725,000 bbl. for the five-year period 1919-1923.

Production of cement in January is restricted to some extent by reason of the fact that mills in some sections using the wet process of manufacture are unable to operate because of weather conditions. Also, numerous mills close down for repairs made necessary by the inherently rough usage to which equipment is subjected throughout the year.

The large shipments during January of this year are undoubtedly due to more general building activities as a result of an open winter in many sections than has been usual during winter months. Also partially to the fact that in some localities a greater amount is being stored for future use when heavy seasonal demands usually aggravate an already overtaxed transportation situation.

This report will be followed with similar ones monthly which will carry accumulated totals from January 1.

JANUARY PRODUCTION, SHIPMENTS AND STOCKS OF PORTLAND CEMENT

	United States Geological Survey Producing Districts	Number of Mills*	PRODUCTION JANUARY 1923	1922	1921	SHIPMENTS JANUARY 1923	1922	1921	STOCKS AT END OF JANUARY 1923	1922	1921
1	Eastern Pennsylvania, New Jersey and Maryland	R 21 E 1 N	2,111	1,134	752	1,101	701	598	3,272	3,371	2,360
2	New York	R 8 E N	311	143	372	128	93	124	699	917	763
3	Ohio, Western Pennsylvania and West Virginia	R 9 E 1 N	631	403	348	428	205	187	1,002	1,247	961
4	Michigan	R 11 E 1 N	188	213	57	174	104	82	638	848	617
5	Illinois, Indiana and Kentucky	R 8 E 2 N 1	1,129	587	793	995	325	339	1,668	2,356	1,925
6	Virginia, Tennessee, Alabama and Georgia	R 7 E N	530	305	280	473	288	247	230	392	256
7	Eastern Missouri, Iowa and Minnesota	R 9 E N	1,081	387	460	555	191	207	1,931	1,894	1,448
8	Western Missouri, Nebraska, Kansas and Oklahoma	R 10 E 1 N 2	386	363	238	420	189	163	844	997	678
9	Texas	R 5 E N	372	234	180	353	182	134	209	349	189
10	Colorado and Utah	R 5 E N	78	20	73	86	39	39	178	168	188
11	California	R 6 E 3 N 1	673	505	498	721	562	398	189	485	485
12	Oregon, Washington and Montana	R 8 E N	167	0	47	116	56	54	425	297	328
	TOTAL	R107 E 9 N 4	7,657	4,294	4,098	5,550	2,935	2,572	11,285	13,321	10,198

Figures represent barrels, 000 omitted. One barrel equals four sacks. S-17

*R—Mills reporting.
E—Mills estimated.
N—Mills not operating.

Action of Sea Water on Portand Cement Concrete

AS is generally known in the concrete world, the exact chemical actions which occur when concrete is exposed to sea water are, as yet, only conjectures on the part of the engineer. One school, which is followed by the Bureau of Standards exhaustive report on his subject and generally approved by most chemists, believes that it is the action of the sulphate of magnesia of the sea water with the lime in the cement, (formed during the setting) and the alumina of the aluminates of the cement, resulting in the formation of hydrated magnesia and calcium sulpho-aluminate which crystallizes with a large number of molecules of water, and that both sodium chloride and magnesium chloride rapidly attack the silicates.

This action is due to the greater affinity of sulphur for calcium so that when the cement and the sea water come together in the nascent state of chemical combination, the sulphur leaves the magnesium and combines with the calcium of the cement, forming calcium sulphate, and leaving the magnesium free. It is for this reason that the magnesium is frequently observed on the exterior of concrete structures which are subjected to the action of sea water. For a time chemists were of the opinion that the magnesia in the cement was in some way responsible for the deterioration. It is the feeling of the chemists of the Southern Pacific Co., who have made a very careful study of this, that magnesia in the normal amounts permitted in portland cement is probably inert and does not cause the cement, in time, to expand and crack. In the transition of the sulphate of magnesia to the sulphate of lime, the two equivalents of water comprise a considerable increase of volume. This formation in itself is sufficient to destroy the cohesion, but the aluminate of lime which exists in cement in common with other calcareous salts possesses the property combining with the sulphate of lime and thus forming sulpho-aluminate of lime.

This combination carries with it such a large quantity of water that it is necessarily increased in volume, which, in turn, totally destroys the cohesion. Fortunately, the magnesium hydrate formed by the actions above described tends to counteract the destructive effect by filling the pores of the concrete so that in this way the material may gradually become impervious to the sea water and disintegration is thereby prevented. After the character of the cement has been changed by the formation of the sulpho-aluminate of lime, the sodium cloride in the water is able to dissolve the calcium silicate in the cement. The calcium set at liberty is dissolved little by little in the water which penetrates the mortar and gradually reduces the concrete. The softening of concrete seems to take place only when there is an abnormal amount of sulphuric acid present.

Sea water has no apparent action on the iron oxides of cement. For that reason (and because of the fact that the setting quality of cement is due to the iron and alumina present, and, as indicated above, alumina is a harmful factor in sea water) it would seem that a cement high in iron is desirable. It is impossible, however, to replace all the alumina by iron, as a product resulting from the burning of ferric oxide and calcium carbonate does not possess hydraulic properties. To produce a cement that will resist the action of sea water, according to a theory embraced by a certain railroad, deduct the percentage of iron from the percentage of alumina. The result should not be less than four.—*From report of Committee, E-6, American Concrete Institute.*

Questions and Answers

Edmund Shaw, Consulting Engineer, Chicago, Ill., Expert on Problems of Screening, Washing and Hydraulic Separation
THE TECHNICAL STAFF OF ROCK PRODUCTS
Edwin Brooker, Washington, D. C., Consulting Expert on Matters of Transportation and Freight Rates
Gordon Smith, First National Bank Bldg., Chicago, Ill., Expert on Crushing and Cement-Plant Problems

No. 33. **Dewatering with Automatic Sand Settlers.**—In the last issue of Rock Products there is described a method of building a long stockpile by a number of dewatering tanks in series. Is this method any better than that of running the sand through small holes in the bottom of a trough? I have seen this method in use and it seemed to give a fairly good product.—J. S.

A.—The method of dewatering of which you speak, by allowing the sand to fall through holes in the bottom of a trough, has been much used in times past, but it is not much seen in use today. It has two disadvantages: it runs out considerable water with the sand and it classifies the sand, putting the coarse sand into the first part of the pile and the fine sand into the last.

The writer does not advise the method, because it does not give definite results either as a classifier or a dewaterer. He has seen it in use with a dredge pump, and the work was very poor. At the times when the dredge was pumping nothing but water, which occurs many times a day, streams of water flowed through the holes and washed away the sand from the pile. The classification was such that all that could be said of it was that one part of the pile was finer than another, but there was no definite line of separation and no such line could be maintained.

For this reason the writer much prefers to use a definite method of classification, which will give the same results in grading sand all the time, and which may be adjusted to give whatever product the market desires. And he very much prefers to dewater with automatic sand settlers, as they give a drier product, and, what is usually of more importance, a much cleaner product.

The dirt follows the water, and the more water that runs away with the sand, the dirtier the sand will be. During such times in which only dirty water runs out of the holes, a considerable amount of clay or dirt will escape with it and leave thin layers of mud throughout the sand. Even where the actual percentage of silt is low, the sand is still liable to rejection if it contains these layers, for a good-sized piece of mud is almost sure to get into the sample that is to be tested.

However, every method of sand recovery has its proper use, and the method referred to may be used where the conditions warrant it. If the mud and silt is in small quantity, there will be little danger of getting dirty sand, and if the feed is even and regular the classification will be fairly good. The method also has a decided advantage in saving headroom.

The best arrangement that the writer has seen for recovering sand in this way had a long, V-shaped trough, with holes every 10 ft. or so. These holes had short, porcelain tubes in them, the kind that electricians use to pass wires through a partition. These did not wear out easily, as an unlined hole in the wood is apt to wear. Being V-shape, the trough acted as a classifier, keeping the coarse sand in the bottom, dragging along slowly, and sending the finer sand to the upper part of the current. In making such a trough, it would be a good idea to widen it at the lower end, where it was desired to take out the fine sand, in order to slow down the current nad allow the sand to settle better. But there will be less current in the lower part of the trough anyway, as so much water escapes with the coarse sand.—E. S.

No. 34. **What Is the Demand for Quartz and Silica Sand and Pebbles Which Occur in a Deposit of High-Grade Clay?**—While fire-clay mortars and other refractory preparations offered the materials trades from this location have met with increasing favor, our attention so far has been given largely to fire-clay. There is a larger field here for quartz and silica pebble products which we have only partially developed, but this field seems to offer better profits to us than fire-clay. Is there a demand for quartz and silica sands and pebbles, both round and flat enough to sustain another concern modeled on a basis similar to the best in the Ottawa, Ill., and Portage, Ohio, regions? Granting this, what approximate expenditures would be necessary for a modern plant to handle from 500 to 1000 tons per day? With whom could I consult as to plant requirements of the particular trade mentioned?—E. J. B.

A.—The demand for this material will necessarily depend upon its character and we would have to see a few samples before suggesting an outlet for it. We doubt if your material is anything like the quartz found at Ottawa and Portage. The silica in these deposits is a very pure rock which crushes and crumbles readily into sand grains of remarkably uniform size. This sand is largely used in foundry practice, for glass manufacture, sand blasting, and similar purposes. About the only extensive use for quartz in the form of pebbles is for stucco finish, surfacing concrete block, etc., besides its use as concrete aggregate. If you will send us a sample of the pebbles, we will turn them over to a consulting engineer, who will doubtless be able to give you his opinion as to their merits.—N. C. R.

No. 35. **Underburning Dolomite.** — In Rock Products for January 27, in the article "Possibilities of Dolomite," it is stated that an Ohio manufacturer has realized the possibilities of underburning the dolomite. Will you give me more of the particulars?—M. C. S.

A.—There is nothing particular to be learned from this manufacturer's operations other than the fact that he uses liberal quantities of steam and simply crowds about twice as much stone through the kiln as he did when he was hard-burning the magnesium oxide. All dolomites will not act the same in a kiln. The big mistake generally made by most dolomite manufacturers is in burning the stone too hard. While the underburned stone will hydrate more slowly, it will be more plastic and have properties that the hard-burned materials never will have. This is a problem for a chemist to determine with each stone. If you care to determine what these possibilities are and desire to investigate any particular stone, we can refer you to competent chemists and engineers. There is nothing really new in this matter of light-burned dolomite as a source of magnesia, but it has a great future in this direction.—N. C. R.

No. 36. **The Difference in Design of Kilns for Burning High Calcium Limestone and for Dolomite.**—Is there a difference in the design of kilns for burning high calcium limestone and for dolomite?—C. S. A.

A.—Leaving out of consideration the relation of diameter to height of kiln, which should be determined by many considerations and is a job for a consulting engineer, or lime-plant expert, recent information published by Messrs. Bole and Shaw on burning dolomite in closed retorts under a slight pressure throws considerable light on lime-kiln design. Some of the best dolomitic lime has been burned in bottle-shaped kilns. The same kind of kiln has given extremely poor results with high calcium limestone. With a high calcium limestone a good draft is of paramount importance to kiln efficiency. Apparently with a dolomite limestone a poor draft and retention of some of the CO_2 in the calcium carbonate are what make a good plastic dolomitic lime.—N. C. R.

Lime Production's Large Increase in 1922

Estimate of the U. S. Geological Survey Shows Industry Is Coming Back Strong

ABOUT 3,528,000 short tons of lime, valued at $33,057,000, was sold in the United States, including Hawaii and Porto Rico, in 1922, according to an estimate made by the United States Geological Survey, from reports received from the principal producers. This quantity is more than 39 per cent greater than that sold in 1921 and only 1 per cent less than that sold in 1920. The average value per ton in 1922 is estimated at $9.37. In 1921 it was $9.83 and in 1920 it was $10.52.

Of the 42 states and territories that produced lime in 1922, five showed a decrease and 37 an increase in output as compared with 1921. This showing is in marked contrast with that for 1921, when the output of 34 states decreased and that of only eight increased. The states that showed decrease in 1922 are all small producers of lime and serve markets that are largely influenced by local demand.

LIME PRODUCED IN THE UNITED STATES IN 1921 AND 1922 (ESTIMATED)

State	1921 Hydrated lime (Short tons)	1921 Total lime Short tons	1921 Total lime Value	1922 (estimated) Hydrated lime (Short tons)	1922 (estimated) Total lime Short tons	1922 (estimated) Total lime Value	Average value Per ton	Percentage of increase or decrease in 1922 Hydrated	Percentage of increase or decrease in 1922 Total
Ohio	346,669	471,053	$ 4,224,579	536,000	717,000	$ 6,700,000	9.34	+ 55	+52
Pennsylvania	135,917	509,891	4,247,509	170,000	700,000	5,521,000	7.89	+ 25	+37
Missouri	45,903	159,194	1,656,560	58,000	201,400	2,017,000	10.01	+ 26	+27
Wisconsin	15,411	124,078	999,407	21,570	187,100	1,524,500	8.15	+ 40	+51
West Virginia	38,335	119,716	1,015,690	44,650	178,000	1,515,000	8.51	+ 17	+49
Alabama	7,030	109,256	847,629	15,500	165,000	1,284,000	7.78	+120	+51
Virginia	11,159	111,518	1,005,677	16,000	156,000	1,250,000	8.01	+ 43	+40
Massachusetts	(*)	124,183	1,890,512	(*)	156,000	1,997,000	12.80	+114	+26
Tennessee	25,719	93,397	733,639	31,600	129,000	1,008,000	7.81	+ 23	+38
Maine	(*)	90,585	1,392,850	(*)	127,300	1,892,000	14.86	+ 11	+41
Indiana	29,605	90,542	826,311	46,000	117,800	1,084,000	9.20	+ 55	+30
New York	(*)	67,685	759,299	(*)	105,000	981,000	9.34	+ 98	+55
Illinois	11,034	58,222	610,197	12,700	76,700	837,000	10.91	+ 15	+32
Maryland	33,553	64,835	558,785	43,000	70,000	550,000	7.86	+ 28	+ 8
California	(*)	42,115	577,366	(*)	60,000	743,000	12.38	+ 84	+42
Texas	19,634	44,404	452,078	20,770	52,000	505,000	9.71	+ 6	+17
Michigan	(*)	48,164	445,386	(*)	50,000	430,000	8.60	+ 51	+ 4
Connecticut	(*)	(*)	(*)	(*)	(*)	(*)	12.00	.....	.....
Vermont	(*)	32,782	460,318	(*)	46,200	513,000	11.10	+ 25	+41
Minnesota	(*)	22,109	232,037	(*)	27,200	249,000	9.15	+ 41	+23
Washington	(*)	17,710	209,761	(*)	25,500	302,000	11.84	— 19	+44
Undistributed	73,001	130,714	1,713,780	109,510	180,800	1,954,500	.....	.....	.....
	792,970	2,532,153	$24,859,370	1,125,300	3,528,000	$33,057,000	9.37	42	39

(*) Included in undistributed.

Economic Conditions in the Industry

The sales of hydrated lime in the United States in 1922 were estimated at 1,125,300 short tons, an increase of 42 per cent over those in 1921 and the largest yet reported. Of the 31 states that reported an output of hydrated lime in 1922, only three showed a decrease. The estimated value of the hydrated lime sold in 1922 was $10,850,000, an average value per ton of $9.64. The average value in 1921 was $9.36.

Reports indicated that about the same number of plants were in operation in 1922 as in 1921, but some of the small plants from which no reports were received may have shut down on account of the scarcity and the high cost of coal. The use of wood to help conserve coal was noted by the manufacturers. It is noticeable, however, that farmers who had not burned lime for several years, started their kilns again in 1921 and 1922 and burned small quantities in field kilns, as the lime so made was cheaper than that which could be bought in the market. Labor appeared to be plentiful, but cars for transportation were not always available.

The demand for lime was obviously better in 1922 than in 1921, but producers report that the market was very irregular. Prices fluctuated greatly throughout the year, but showed a decided downward trend. Lime for construction undoubtedly made the largest increase in production, and chemical lime also increased appreciably, but it is doubtful whether agricultural lime made any increase whatever.

Construction Lime

Though a few producers reported that the demand for construction lime was the same as in 1921, or even less, the greater number reported a much better demand and increases ranging from 3 to 75 per cent. Some reported increases of 100 to 200 per cent. Most producers reported that the first 10 months of the year was the time of greatest demand; others reported a poor market early in the year and improvement late in the summer and in the fall. The average prices in some states were higher and in others lower than in 1921, but the average for the country was doubtless lower.

Chemical Lime

Chemical lime showed decided improvement in demand during the year, according to the manufacturers of lime of this class, but not so decided an improvement as construction lime. Though increases of 5 to 70 per cent and exceptionally of 125 and 160 per cent were reported, there were more reports of fair demand and about the same demand as in 1921 than in the reports for construction lime. The last half of the year appeared to be a time of great improvement in the chemical lime trade in 1922. The sales of refractory lime (dead-burned dolomite), used in patching and lining basic open-hearth furnaces, increased from 107,664 short tons in 1921 to over 300,000 tons in 1922.

Agricultural Lime

Agricultural lime did not show the same encouraging increase as the other two classes of lime, chiefly because of the farmers' inability to buy lime. Some reports showed that there was an increase in the demand for agricultural lime, and that the production could not equal the demand on account of scarcity of fuel, but it is very doubtful whether the production for 1922 will exceed that of 1921.

The accompanying table shows the estimated quantity of hydrated lime and the estimated quantity and value of total lime sold in states reporting sales of more than 20,000 tons. The figures for 1921 are given for comparison.

BRITISH fluxing limestone for blast furnaces now costs about 5s.9d. per ton, as compared with 3s. 4d. before the World War, says *Iron Age*.

Pennsylvania Agstone Producers Plan Campaign

THE National Agstone Association held a general meeting at the Fort Pitt Hotel, Pittsburgh, Pa., on Monday, February 12. Chairman King and President Lamkin alternated in presiding over the forenoon and afternoon sessions and the noon-day luncheon. The following were present:

ATTENDANCE

P. B. Reinhold, Reinhold-Owens Co., Pittsburgh; W. S. Snyder, Templeton Limestone Co.; Harry S. Gault, Templeton Limestone Co., Templeton, Pa.; K. C. Styers, Grove City Limestone Co., Grove City, Pa.; S. G. Wells, George & Sherrard Paper Co., Wellsburg, Pa.; Harry H. Brandon, Ohio Marble Co., Piqua, Ohio; Glenn H. Campbell, "National Stockman & Farmer," Pittsburgh; R. S. Newman, "Ohio Farmer," Cleveland; C. T. Kline, E. J. Lavino Co., Philadelphia; E. C. Foster, E. J. Lavino & Co., Pittsburgh; E. R. Walker, "Pennsylvania Farmer," Philadelphia; H. E. Bair, France Stone Co., Toledo; Clyde Calvin, Bessemer Limestone and Cement Co., Youngstown; Charles E. Meals, Kittanning Limestone Co., Kittanning, Pa.; W. H. Margraf, Marble Cliff Quarries Co., Columbus; J. C. King, Carbon Limestone Co., Youngstown; Prof. J. W. White, Pennsylvania State College; E. M. Lamkin, Kelley Island Lime and Transport Co., Cleveland; Edward S. Bixler, Bert W. Kessel, Limestone Products Corp. of America, Newton, N. J.; C. L. Potts, J. M. Rawlins, P. N. Dennison, du Pont Co., Pittsburgh; F. C. Earnshaw, H. T. McCartney, Carbon Limestone Co., Youngstown; Ellwood Gilbert, New Castle Lime and Stone Co., New Castle, Pa.; William F. Stotzenbach, John C. Denison, National Mortar and Supply Co., Pittsburgh; A. R. Chambers, Michigan Limestone and Chemical Co., Pittsburgh; A. P. Sandles, secretary; Claude L. Clark, assistant secretary, Columbus.

The following firms indicated in writing their desire to become members:

NEW MEMBERS

Kittanning Limestone Co., Kittanning (Charles E. Meals); Limestone Products Corp. of America, Newton, N. J. (Edward S. Bixler); New Castle Lime and Stone Co., New Castle, Pa. (Ellwood Gilbert); E. J. Lavino & Co., Philadelphia, Pa. (C. F. Kline).

Plans of general advertising and promoting the sale of agricultural limestone were discussed. Mr. Bixler made a forceful talk on salesmanship and the Pennsylvania agstone producers were enthusiastic in their desire to co-operate in broadcasting the virtues of agstone. President Lamkin and Chairman King outlined the need and advantages of co-operation and made an appeal to all producers who sold agstone in Pennsylvania to join in an advertising and promotional campaign. Representatives of the farm press present urged an early decision on an advertising policy.

The chairman stated that the following firms had made application at the Chicago meeting for membership:

Templeton Limestone Co., Templeton, Pa.; Dolomite Products Co., Rochester, N. Y.; A. N. Spencer, Columbia, Mo.; Texas Stone Products Co., Dallas, Texas; National Mortar and Supply Co., Pittsburgh; Bemis Bag Co., Peoria, Ill. (associate member).

At the suggestion of Pennsylvania producers, Mr. Bixler of New Jersey and Prof. White of State College, Pa., an agreement was reached to hold a general meeting at Harrisburg Tuesday, March 6, at the Penn-Harris hotel, 9:30 a. m., to discuss soil conditions, advertising and promotion campaign for Pennsylvania, Maryland, Delaware, New Jersey and New York.

Prof. White was a high-spot in this meeting. For many years he has preached the gospel of limestone and lime. He said that the State College had made a survey of soil conditions which indicated an absolute need of 1,500,000 tons of agstone per year in Pennsylvania, and that less than one-fifth of this amount was now used.

This most startling statement aroused the interest of all present. He also said that the use of limestone and lime had brought Pennsylvania from 16th place as an agricultural state up to seventh place in the Union; that Pennsylvania offered great opportunities for honest co-operative promotion and agstone salesmanship. He said he would attend the Harrisburg meeting, but would be impartial as between raw limestone and burned lime.

NATIONAL AGSTONE ASSOCIATION will hold a general meeting at the Penn-Harris Hotel, Harrisburg, Pa., on March 6, 1923.

The meeting was of so much interest as to hold everybody until 5 p. m., the hour of adjournment. Everybody agreed to boost for a big meeting at Harrisburg March 6. Secretary Sandles reported that many agstone producers, agricultural colleges and schools were sending in orders for the agstone textbook, "Dollars and Sense."

The following letter was sent to Prof. White:

"Our boys appreciate your presence at the Pittsburgh agstone meeting. You contributed much to its great success. We expect you at Harrisburg on the 6th of March.

"We are sending an invitation to President We are sending an invitation to President Thomas of State College to break bread with us and give us the benefit of his counsel. We want you to personally urge his presence. Your years of work as a pioneer and your helping hand in this good cause are fully appreciated. We are at your service."

Calcium Company Increases Facilities

EXTENSIVE improvements under way by the Koury Calcium Co., which operates a plant on the Cotton Belt railroad in Coryell county, 32 miles west of Waco, according to B. F. Litsinger of Waco, who is president.

A hydrating plant will be installed, and contracts have been let for machinery of the most modern design. An additional 500-ft. siding is being built to the plant. The lime mill will be increased to a 200-ton plant per day. Crushed stone for highways will also be produced.

According to President Litsinger, the rock to be mined has been tested and assayed 99.4 per cent pure. This, he says, is the only rock of its kind in the United States with such high calcium content, and that the closest approach to it anywhere in the world is found in Dover, England.

Directors of the company are: W. V. Hanover, J. P. Philps, B. F. Litsinger, C. P. Schafer, J. L. Spurlin, Sr., and R. H. Threet. Officers, other than President Litsinger, are: Vice-presidents, C. P. Schafer and J. P. Philps; secretary-treasurer, W. V. Hanover.

Cleveland's Big Building Exposition

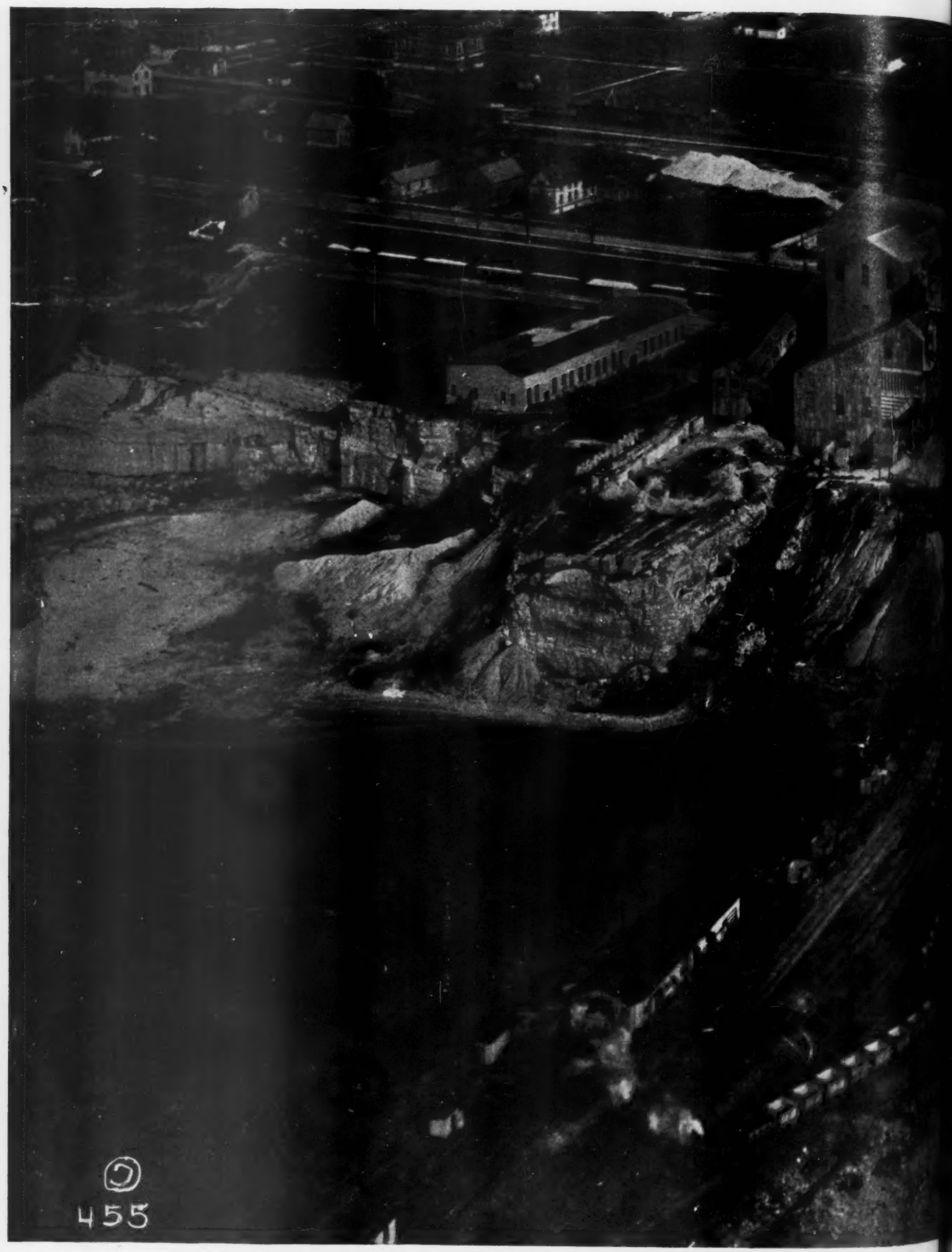
WHAT is said to be the biggest exposition idea ever staged in this country is being planned as a feature to the sixteenth annual convention of the National Association of Real Estate Boards to be held in Cleveland, June 25 to 30. All classes of building material used in the construction of both domestic and commercial buildings will be on display, each exhibit having a constructive and educational value which, it is aimed, will make this exposition unique.

In addition, invitations to exhibit have been extended to all national associations affiliated with the building industry, among them the Indiana Limestone Association and the Portland Cement Association, Southern Pine Association, West Coast Lumbermen's Association, and many others.

The exposition committee consists of M. G. Gould as chairman; W. J. Van Aken, vice-chairman; Vance Stewart, James G. Bingham and Claude W. Shimmon, supported by the 1200 members of the Cleveland Real Estate Board.

Increase of Cement Rates

INCREASE of rates on portland cement from Sugar Creek to St. Joseph, announced as effective January 15, were suspended by the Public Service Commission at Jefferson City, Mo., until May 14, pending a hearing. The proposed increase was from 7 to 9 cents per 100 lb. on carload specials.



This is one of the largest crushing plants in the world. It is operated by the Brownell Improve

hicago, a

Chicago, and turns out 10,000 tons daily. The plant is in Thornton, Ill.

Quarried from Life

By Liman Sandrock

Thirty Years of Service!

IT must be a grand and glorious feeling to to be able to boast of 30 continuous years of service in this industry; to have your record eulogized by your company head in these words: "Such an achievement is attained only by men of outstanding character, brains and energy;" to be given a dinner and to be praised by your friends and associates—and lastly, to be the recipient of a set of golf clubs and a leather bag and a reindeer coat! Say, wouldn't all this set your heartstrings aquiver?

Well, it all happened to Vice-President John F. Pollock of the Ash Grove Lime and Portland Cement Co., of Kansas City, at a dinner recently given by President Lester T. Sunderland in appreciation of Mr. Pollock's thirtieth year of active service with the Ash Grove Co.

During this long period Mr. Pollock has become mighty well known to hundreds in the building-material industry who cherish his personal acquaintanceship and have learned to respect and admire him for his ethical business standards and his genial personality.

As spokesman for Mr. Pollock, President Sunderland recounted Mr. Pollock's business career. After his education at Washington and Jefferson University he heeded Horace Greeley's counsel to the young men of his time to "Go West!" leaving his home in Alleghany county, Pa., for Omaha, Neb., in 1888. Shortly after his arrival he entered the offices of the Omaha Coal, Coke and Lime Co., later reorganized as Sunderland Brothers Co. Mr. Pollock remained with this company until his subsequent connection in 1893 with the Ash Grove White Lime Association, which afterward became known as the Ash Grove Lime and Portland Cement Co.

This dinner also gave Mr. Sunderland an opportunity to express his happiness in being able to devote all of his time to the Ash Grove Co., and to compliment the men who "carried on" during his two years' administration, just closed, as president of the Portland Cement Association. He also referred to the unique engrossed parchment presented to him by that association in appreciation of his services as his "most prized earthly possession."

As usually happens at such business family affairs when industrial cares are laid aside and one's associate let down the bars and display their human, lovable natures, toasts were drunk and short informal talks were given by Secretary W. P. Sabin, Managing Engineer Andrew Lundteigen, Sales Manager R. E. Robertson and his assistant, "Bill" Anderson, and F. M. Ferguson, the Iowa representative.

When it came to the presentation of the golf "equipment" and the coat of reindeer skin, apprehension was expressed that such a gift might tempt Mr. Pollock to terminate

John F. Pollock, Vice-President of the Ash Grove Lime and Portland Cement Co.

his years of service in an effort to qualify as a golf expert, he promptly dispelled any such fears. Truly, it must be a real temptation with such an outfit, but hard work in this industry is a real pleasure—the reason, may be, why so many of its toilers attain many years of service without wearing down or going stale.

Mr. Sunderland's 25 guests included the officers of the company and the members of the sales, advertising, traffic, engineering and accounting departments.

Let us forward Mr. Pollock the words of Falstaff as given in Shakespeare's "Henry IV" as our affectionate concern for his future: "Your lordship, though not clean past your youth, hath yet some smack of age in you, some relish of the saltness of time; and I most humbly beseech your lordship to have a reverend care of your health."

Bustin' the VIIth Commandment

SAY, Lyman, did you lamp that Brooklyn, N. Y., dispatch wherein a local coal dealer dyed 200 tons of stone—just flooded it with some black fluid—and then got 1400 perfectly good dollars for the lot as anthracite?

First thing we know, some gink will be sousing sawdust in the Chicago river and then peddling it for soft coal if we don't watch out. It ought to burn, and that's more than this Brooklyn stuff would do.

New York. A. BRESCHASKIN.

They Said It

WE HAD a bully wheeze on ol' Tuthankhamen, again so popular after 3000 years, when along comes the smart alecs saying he was no 2-tanker, and— No more pharaoh bunk for us hen's forehead!

THE HIGHWAY EDUCATION BOARD has started a prize contest on "Highways and Religion." They should go hand in hand, but how about that "straight and narrow path," and the difference between the concrete and the abstract?

HERE'S ONE from Editor MacPherson's *Quarry Managers' Journal* (London): Over the phone—"Hello, hello! Is this you, Mac?"

"Aye."

"Is this MacPherson I'm talking to?"

"Ay; spe'kin!"

"Well, Mac, it's like this. I want to borrow a fiver"—

"All right, I'll tell him soon's he comes in."

AT THE ROAD SHOW: "Say, that crawler crane of yours, swinging, swiveling, pivoting, rolling—well, it makes a cabaret shimmy artist look like a totem pole!"

OFFICER, THEY'RE IN AGAIN! Illinois' Springfield dictators think they see a chance of handling $5,000,000 through a bill asking for a state cement plant. It's a big lump of money, with a Small chance for getting it. Forgetting it goes!

DICK MOSS is assisting in building a gravel plant near Oswego.—*Plainfield (Ill.) Enterprise.* Go to it, Dick!

THE GOVERNMENT has a new treatment for smut. If it would only keep the coal-dust off our favorite light hat, it would be a smut-grain of comfort.

SWEET? We'll say so! Governor Sweet of Colorado wants his legislature to help him operate a state-owned cement plant. Like the wayside pit, anybody can operate a cement plant, and it's really sweet of Sweet to provide against the day when the wicked cement maker would seek to mulct the innocent taxpayer. He also has some suggestions for changes in the state insane asylum—but perhaps there is no relation between these suggestions and the proposed cement plant.

Editorial Comment

Good Year for Farm Business

There is every evidence that 1923 is going to be an excellent year for industries which depend on the farmers for orders. One of the best indexes of this is the reports of business done and profits made by the big mail order houses—such as Sears-Roebuck and Montgomery Ward. They are increasingly encouraging. The fertilizer business is steadily improving. Farmers are buying again and there is much they will have to buy to make good their failure to keep their farms up during the last two or three years. The spring outlook for agricultural lime, limestone and phosphate rock has never been better; and this optimism is reflected in the remarkably large and enthusiastic meeting of the National Agricultural Limestone Association at Pittsburgh. The March 5 meeting at Harrisburg should prove an epoch-making one.

Side-of-the-Road Concrete Aggregates

One of the problems of the commercial sand and gravel industry, and to a lesser degree, the crushed stone and slag industries, is to "sell" engineers, architects and contractors on "commercial" aggregates as against "side-of-the-road" aggregates. (By side-of-the-road aggregates are meant sand, gravel or crushed stone produced on the job by a portable or temporary plant operated by the contractor or local engineering authorities.) Whenever sand and gravel men get together there is always much talk about getting engineers and contractors and highway authorities to appreciate the virtues of commercial sand and gravel; and they generally have a more or less hazy idea of how to go about it.

Probably there is only one way that this object can be actually and satisfactorily accomplished and that is by active co-operation of the organized sand and gravel industry with engineers in research work, which will establish *facts* about concrete aggregates rather than *conjectures*. Research data can generally be interpreted in many ways; and only too frequently for scientific truth they are interpreted by various "authorities" who have a bias, consciously or unconsciously, because they have pet theories to verify. And, unfortunately for the sand and gravel industry, there seems never to have been a research specialist, or a compiler of research material, whose bias has been in favor of commercially produced material.

In other words, it is the same old maxim, that if you want your ax ground, the safest and surest way is to grind it yourself. Other people are too busy grinding their own to give much thought to yours. This does not mean that the rank-and-file of engineering research data are unreliable; merely, that their interpretation has often been more or less inaccurate or biased. There is not so much need of new research work in concrete aggregates as there is need for interpretation and practical use of what has already been done. And, in this activity, the sand and gravel industry should certainly play a leading role.

That engineers and contractors would welcome such help is evidenced every day in many ways. For example, at the recent convention of the American Concrete Institute, Walter P. Bloecher, of Stone & Webster, Inc., New York City, read a paper on "An Analysis of the Variables in Concrete from the Construction Standpoint," in which he said:

> With our present-day refinement in the design and application of concrete, the principal problem of the industry, stated in the abstract, is how to get predetermined uniformity of strength. Recent researches have perfected our knowledge of the factors involved to such an extent that, given normal materials and conditions, this can be accomplished in any good laboratory with reasonable certainty of results.
>
> The problem of getting uniform results in the field is distinctly different from that in the laboratory. In the latter generally all of the many variables are and can be rigidly controlled, except the particular ones under investigation. This control is possible to a degree unattainable in practice by (1) use of selected uniform materials (often artificially prepared) of known characteristics; (2) methods and apparatus of great precision; (3) protection from weather; (4) absence of the necessity for strict economy; (5) skilled permanent talent, and (6) the relatively small magnitude of the physical operations. These, with all the sub-headings which they embrace, make up the wide gap between laboratory and field concrete.
>
> The speaker recalls a recent construction operation with which he was connected on which erratic concrete test results were given a great deal of study. The testing laboratory, the cement, the organic sand impurities, the mica in the sand, insufficient mixing time, too much water, and improper curing of cylinders were successively blamed and studied. Finally a new laboratory was engaged, the sand was re-washed at added cost, the mixing and curing methods were made more strict, and somewhat better test results were had. But it is worth noting that no one could definitely place the credit for the improvement.

Here then is a great problem fairly presented, to be solved by every one interested in bettering concrete construction; here is an opening for 100 per cent co-operative research. Let the commercial sand and gravel producers take the part that belongs to them, and help Mr. Bloecher (and the thousands of other engineers like him) to determine just what part his first variable—*use of selected uniform materials of known characteristics*—plays in obtaining the uniformity in the field with concrete that he is working for. We believe that this is the most important string to his fiddle; and we would like to see you, Mr. Producer, prove it.

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:						
Blakeslee, N. Y.	1.00	1.25	1.10	1.10	1.10	.....
Buffalo, N. Y.			1.50 per net ton all sizes			
Chaumont, N. Y.	1.00	.....	1.75	1.50	1.50	1.50
Cobleskill, N. Y.	1.25	1.25	1.25	1.25	.....	.....
Coldwater, N. Y.			1.50 per net ton all sizes			
Eastern Penna.	1.35	1.35	1.35	1.35	1.35	1.35
Munns, N. Y.	1.00	1.25	1.25	1.25	1.25	.....
Prospect, N. Y.	.80	1.30	1.40	1.30	1.30	.....
Walford, Pa.	1.55	1.55	1.55	1.55	1.55	1.55
Watertown, N. Y.	.....	.....	1.50	1.25	1.25	1.25
Vestern New York	.75	1.20	1.20	1.20	1.20	1.20
CENTRAL:						
Alton, Ill.	.....	.....	1.50	.....	.....	.....
Buffalo, Iowa	.90	.....	1.35	1.15	1.20	1.20
Chasco, Ill.	1.30	1.25	1.25	1.25	1.20	.....
Chicago, Ill.	1.30	1.70	1.30	1.30	1.30	1.30
Dundas, Ont.	1.00	1.35	1.35	1.25	1.10	1.10
Greencastle, Ind.	1.25	1.10	1.00	.90	.90	.90
Krause, Columbia and Valmeyer, Ill.	1.00@1.30	1.00@1.30	1.00@1.30	1.00@1.30	1.00@1.30	1.30@1.50
Lannon, Wis.	.85	.....	1.05	.95	.95	.95
Mitchell, Ind.	.80	.80	.80	.80	.80	.80
Montreal, Canada	.80	1.35	1.05	.95	.90	.....
Montrose, Iowa	.....	1.50	1.60	1.55	1.45	1.40
Sheboygan, Wis.	1.10	1.10	1.10	1.10	1.10	.....
Southern Illinois	1.35	1.40	1.35	1.30	1.25	.....
Stolle, Ill. (I. C. R. R.)	1.30	.....	1.35	1.35	1.35	1.35
Stone City, Iowa	.75	.....	1.40	1.30	1.25	.....
Toledo, Ohio	1.60	1.70	1.70	1.70	1.60	1.60
Toronto, Canada	1.90	2.25	2.25	2.25	2.00	2.00
			Prices include 90c freight			
Waukesha, Wis.			All sizes 1.00 per ton			
SOUTHERN:						
Alderson, W. Va.	.75	1.25	1.40	1.25	1.15	.....
Bridgeport, Texas	1.25	1.25	1.40	1.40	1.40	1.25
Bromide, Okla.	.75	2.00	1.75	1.60	1.50	1.25
Cartersville, Ga.	.....	2.00	1.25	1.25	1.25	.....
Chickamauga, Tenn.	.75@1.00	.90@1.25	.....	.75@1.00	.75@1.00	.....
El Paso, Texas	1.00	1.00	1.00	1.00	1.00	.....
Ft. Springs, W. Va.	.60	1.15	1.40	1.35	1.20	.....
Garnet and Tulsa, Okla.	.50	1.60	1.60	1.45	1.45	.....
Ladds, Ga.	.....	.....	1.40	1.40	1.40	.....
Morris Spur (near Dallas), Tex.	1.25	1.25	1.40	1.40	1.40	1.25
WESTERN:						
Atchison, Kans.	.50	1.80	1.80	1.80	1.80	1.80
Blue Spr'gs and Wymore, Neb.	.25	1.65	1.65	1.55	1.45	1.40
Cape Girardeau, Mo.	1.35	.....	1.10	1.35	1.10	.....
Kansas City, Mo.	1.00	1.50	1.50	1.50	1.50	1.50

Crushed Trap Rock

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Branford, Conn.	.60	1.50	1.30	1.10	1.00	.....
Bound Brook, N. J.	1.80	2.30	1.90	1.50	1.40	.....
Dresser Jct., Wis.	1.00	2.25	.....	1.75	2.00	.....
Duluth, Minn.	.90@1.00	2.25	1.75@2.00	1.35	1.35	1.35
E. Summit, N. J.	2.30	2.50	2.20	1.90	1.60	.....
Eastern Massachusetts	.60	1.85	1.40	1.40	1.40	1.40
Eastern New York	.75	1.50	1.30	1.30	1.40	1.40
Eastern Pennsylvania	1.25	1.70	1.60	1.50	1.40	1.40
New Britain, Middlefield, Rocky Hill, Meriden, Conn.	.60	1.35@1.45	1.15@1.25	1.05	.95@1.00	.....
Oakland, Calif.	1.75	1.75	1.75	1.75	1.75	.....
Richmond, Calif.	.50*	.....	1.50*	1.50*	1.50*	.....
Spring Valley, Calif.	.70	1.55	1.50	1.40	1.35	1.35
Springfield, N. J.	2.00	2.25	2.10	1.85	1.85	.....
Westfield, Mass.	.60	1.35	1.25	1.10	1.00	.....

Miscellaneous Crushed Stone

City or shipping point	Screenings, ¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
Buffalo, N. Y.—Granite	.90	.....	1.20	1.00	1.05	1.10
Berlin, Utley and Red Granite, Wis.	1.60	1.70	1.60	1.50	1.40	.....
Columbia, S. C.—Granite	.50	.....	2.00@2.50	2.00	.....	1.75@2.00
Dundas, Ont.—Limestone	1.00	1.35	1.35	1.25	1.10	1.10
Eastern Penna.—Sandstone	.85	1.55	1.55	1.40	1.35	1.30
Eastern Penna.—Quartzite	1.20	1.30	1.20	1.20	1.20	1.20
Lithonia, Ga.—Granite	1.00	.....	1.50	1.25	1.00	1.00
Lohrville, Wis.—Cr. Granite	1.35	1.40	1.30	.....	1.20	.....
Middlebrook, Mo.—Granite	3.00@3.50	.....	2.00@2.25	2.00@2.25	.....	1.50
San Diego, Calif.	.50@ .70	1.45@1.75	1.40@1.70	1.30@1.60	1.25@1.55	1.25@1.55
Sioux Falls, S. D.—Granite	1.00	1.60	1.55	.....	1.50	.....

*Cubic yard. †Agrl. lime. ||R.R. ballast. §Flux. ‡Rip-rap, a 3-inch and less.

Agricultural Limestone (Pulverized)

Chaumont, N. Y.—Analysis, 95% $CaCO_3$, 1.14% $MgCO_3$—Thru 100 mesh; sacks, 4.00; bulk	2.50
Grove City, Pa.—Analysis, 94.89% $CaCO_3$, 1.50% $MgCO_3$; 60% thru 100 mesh; 45% thru 200 mesh; sacks, 5.00; bulk	3.50
Hillsville, Pa.—Analysis, 92% $CaCO_3$, 1.67% $MgCO_3$, 75% thru 100 mesh; 100% thru 50 mesh; sacks, 5.00; bulk	3.50
Jamesville, N. Y.—Analysis, 89.25% $CaCO_3$; 5.25% $MgCO_3$; pulverized, bags, 4.00; bulk	2.50
New Castle, Pa.—89% $CaCO_3$, 1.4% $MgCO_3$—75% thru 100 mesh, 84% thru 50 mesh, 100% thru 10 mesh; sacks, 4.75; bulk	3.06
Walford, Pa.—Analysis, 50% thru 100 mesh; 4.50 in paper; bulk	3.00
Watertown, N. Y.—Analysis, 96% $CaCO_3$; .02% $MgCO_3$; all pass 100 mesh; bulk, 2.50; sacks	4.00
West Stockbridge, Mass., Danbury, Conn., North Pownal, Vt.—Analysis, 90% $CaCO_3$—50% thru 100 mesh; paper bags, 4.25—cloth, 4.75; bulk	3.00
Alton, Ill.—Analysis, 97% $CaCO_3$, 0.1% $MgCO_3$; 90% thru 100 mesh 99% thru 200 mesh	5.00 8.00
Belleville, Ont.—Analysis, 90.9% $CaCO_3$, 1.15% $MgCO_3$—45% to 50% thru 100 mesh, 61% to 70% thru 50 mesh; bulk	2.50
Chasco, Ill.—Analysis, 96.12% $CaCO_3$, 2.5% $MgCO_3$; 90% thru 100 mesh..	5.00
Pulverized limestone	1.35
Detroit, Mich.—Analysis, 88% $CaCO_3$, 7% $MgCO_3$—75% thru 200 mesh, 2.50@4.75—60% thru 100 mesh	1.80@3.80
Marblehead, Ohio—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; 60% thru 100 mesh; 70% thru 50 mesh; 100% thru 10 mesh; sacks	4.50
Bulk	3.00
Piqua, Ohio—70% thru 100 mesh; bags, 5.00; bulk	3.50
90% thru 100 mesh; bags, 7.00; bulk..	5.50
Yellow Springs, Ohio—Analysis, 96.08% $CaCO_3$, 63% $MgCO_3$; 32% thru 100 mesh; 95.57%, sacked. 6.00; bulk	4.25
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$; 50% thru 100 mesh	1.50
Hot Springs, N. C.—50% thru 100 mesh; sacks, 4.25; bulk	2.70
Knoxville, Tenn.—80% thru 100 mesh	2.70
Linville Falls, N. C.—Analysis, 57% $CaCO_3$, 39% $MgCO_3$; 50% thru 100 mesh; bulk	2.75
Mountville, Va.—Analysis, 76.60% $CaCO_3$, 22.83% $MgCO_3$—50% thru 100 mesh; 100% thru 20 mesh; sacks	5.00
Colton Calif.—Analysis, 95% $CaCO_3$, 3% $MgCO_3$—all thru 20 mesh—bulk	4.00
Lemon Cove, Calif.—Analysis, 94.8% $CaCO_3$, 0.42% $MgCO_3$; 60% thru 200 mesh; sacks, 5.25; bulk	4.50

Agricultural Limestone (Crushed)

Alton, Ill.—Analysis, 98% $CaCO_3$, 0.1% $MgCO_3$; 90% thru 50 mesh	1.50
Bellevue, Ohio—Analysis, 61.56% $CaCO_3$, 36.24% $MgCO_3$; ¼ in. to dust, about 20% thru 100 mesh	1.25
Bettendorf, Ia., and Moline, Ill.—97% $CaCO_3$, 2% $MgCO_3$; 50% thru 50 mesh; 50% thru 4 mesh	1.50 1.00
Buffalo, Ia.—90% thru 4 mesh	
Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.3% $MgCO_3$; 50% thru 4 mesh	1.35
90% thru 4 mesh, cu. yd	1.35
Chicago, Ill.—Analysis, 53.63% $CaCO_3$, 37.51% $MgCO_3$; 90% thru 4 mesh	.80
Columbia, Ill., near East St. Louis—½-in. down	1.25@1.80
Elmhurst, Ill.—Analysis, 35.73% $CaCO_3$, 20.69% $MgCO_3$—50% thru 50 mesh	1.25
Huntington and Bluffton, Ind.—Analysis 61.56% $CaCO_3$, 36.24% $MgCO_3$; about 20% thru 100 mesh	1.25
Greencastle, Ind.—Analysis, 98% $CaCO_3$—50% thru 50 mesh	2.00
Kansas City, Mo.—50% thru 100 mesh	1.50

(Continued on next page)

Agricultural Limestone

(Continued from preceding page)

Krause and Columbia, Ill.—Analysis, 90% $CaCO_3$, 90% thru 4 mesh..... 1.20

Lannon, Wis.—Analysis, 54% $CaCO_3$, 44% $MgCO_3$; 99% thru 10 mesh; 46% thru 60 mesh..... 2.00

Screenings (¼ in. to dust)..... 1.00

Marblehead, O.—Analysis, 83.54% $CaCO_3$, 14.92% $MgCO_3$; screenings, 40% thru 100 mesh, 53% thru 50..... 1.25

60% thru 100 mesh, 70% thru 50 mesh, 100% thru 10 mesh; sacks, 5.00; bulk 3.50

Milltown, Ind.—Analysis 94.41% $CaCO_3$, 2.95% $MgCO_3$; 33.6% thru 100 mesh, 40% thru 50 mesh..... 1.25@1.65

Mitchell, Ind.—Analysis, 97.65% $CaCO_3$, 1.76% $MgCO_3$, pulverized limestone 1.50

Montrose, Ia.—90% thru 100 mesh..... 1.25

Narlo, Ohio—Analysis 56% $CaCO_3$, 43% $MgCO_3$, limestone screenings, 37% thru 100 mesh; 55% thru 50 mesh; 100% thru 4 mesh..... 1.50@2.00

Ohio (different points), 20% thru 100 mesh; bulk ..... 1.25@1.50

River Rouge, Mich.—Analysis, 54% $CaCO_3$, 40% $MgCO_3$; bulk..... .80@1.40

Stolle, Ill., near East St. Louis on I. C. R. R.—Thru ½-in. mesh..... 1.30

Stone City, Ia.—Analysis, 98% $CaCO_3$ 50% thru 50 mesh..... .75

Toledo, Ohio—¼-in. to dust, 20% thru 100 mesh ..... 1..0

Waukesha, Wis.—No. 1 kiln dried..... 2.00

No. 2 Natural..... 1.75

Alderson, W. Virginia—Analysis 90% $CaCO_3$; 90% thru 50 mesh..... 1.75

Cape Girardeau, Mo.—Analysis, 93% $CaCO_3$, 3.5% $MgCO_3$..... 2.00

90% thru 4 mesh..... 1.50

Cartersville, Ga.—Analysis 66% $CaCO_3$, 33% $MgCO_3$—all passing 10 mesh..... 1.75

Claremont, Va.—Analysis, 92% $CaCO_3$, 2% $MgCO_3$; 90% thru 50 mesh..... 3.00

50% thru 50 mesh; 90% thru 4 mesh; 50% thru 4 mesh..... 2.75

Ft. Springs, W. Va.—Analysis, 90% $CaCO_3$—90% thru 50 mesh..... 1.50

Ladds, Ga.—50% thru 50 mesh..... 2.00

Garnett, Okla.—Analysis, 80% $CaCO_3$, 3% $MgCo_3$; 50% thru 50 mesh ..... .50

Kansas City, Mo., Corrigan Sid'g—50% thru 100 mesh; bulk..... 1.80

Tulsa, Okla.—90% thru 4 mesh..... .50

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated.

GLASS SAND:

Berkeley Springs, W. Va..... 2.00@2.25

Cedarville and South Vineland, N. J.—Damp, 1.75; dry..... 2.25

Cheshire, Mass. (damp)..... 2.50

Columbus, Ohio ..... 1.50@ 2.00

Dunbar, Pa. (damp)..... 2.50

Falls Creek, Pa..... 2.25

Hancock, Md.—Damp, 1.50; dry..... 2.00

Klondike and Pacific, Mo..... 2.50

Mapleton, Pa. ..... 2.00@ 2.50

Mapleton Depot, Pa.—Damp, 2.00; dry 2.75

Massillon, Ohio 3.00

Michigan City, Ind. ..... .50@ .55

Mineral Ridge, Ohio..... 2.75

Montoursville, Pa. 2.00

Oregon, Ill. ..... 1.50@ 2.00

Ottawa, Ill. 2.50

Pittsburgh, Pa.—Dry, 4.00; damp..... 3.00

Rockwood, Mich. ..... 2.50@ 3.00

Round Top, Md..... 2.25

Sands, Pa. 2.50

San Francisco, Cal..... 3.00@ 3.50

St. Mary's, Pa. 3.00

Thayers, Pa. 2.50

Utica, Ill. 1.50

Zanesville, Ohio ..... 2.00@ 2.50

FOUNDRY SAND:

Albany, N. Y.—Core..... 1.25@1.75

Furnace lining ..... 2.25@2.75

Molding fine, coarse and brass molding (winter shipment)..... 2.25@2.50

Sand blast (kiln dried)..... 2.25@4.00

Allentown, Pa.—Core and molding fine 1.50@1.75

Arenzville, Ill.—Molding fine ..... 1.50@1.75

Brass molding 1.75

Beach City, O.—Core, washed and screened ..... 2.00@2.50

Furnace lining ..... 2.50@3.00

Molding fine and coarse..... 2.25@2.50

Cheshire, Mass.—Furnace lining, molding, fine and coarse..... 5.00

Sand blast ..... 5.00@8.00

Stone sawing 6.00

Cleveland, O.—Molding coarse..... 1.50@2.00

Brass molding ..... 1.50@2.00

Molding fine ..... 1.50@2.25

Core ..... 1.25@1.50

Columbus, Ohio—Core ..... .50@1.50

Sand blast ..... 3.50@5.00

Molding fine ..... 2.75@3.00

Molding coarse ..... 2.50@3.00

Brass molding ..... 2.50@3.00

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Wholesale Prices of Sand and Gravel

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Washed Sand and Gravel

City or shipping point	Fine Sand, 1/10 inch down	Sand, ¼ inch and less	Gravel, ½ inch and less	Gravel, 1 inch and less	Gravel, 1½ inch and less	Gravel, 2 inch and less
EASTERN:						
Ambridge and So. Heights, Pa.	1.15	1.15	1.15	1.15	.70	.70
Erie, Pa.		.60	.90		1.00	
Farmingdale, N. J.	.48	.48	1.00	1.00	1.20	
Hartford, Conn.	.90		1.25	1.15	1.15	1.15
Leeds Junction, Me.		.50	1.75	1.35	1.35	1.25
Machias, N. Y.	.75	.75	1.50	.85	.85	.85
Pittsburgh, Pa.	1.15	1.15	1.00	.70	.70	.70
Portland, Maine		.50	1.75		1.35	1.35
Washington, D. C. (rewashed, river)	.75	.75	1.60	1.40	1.20	1.20
CENTRAL:						
Alton, Ill.		.85				
Anson, Wis.	.50	.40				.90
Barton, Wis.	.60	.60	.70	.70	.70	.70
Beloit, Wis.		.70			.80	
Chicago, Ill.		1.75@2.23	1.75@2.43			
Cincinnati, Ohio	.70	.65	.90	.90	.90	.90
Columbus, Ohio	.75	.75@1.00	.75@1.00	.75@1.00	.75@1.00	.75@1.00
Des Moines, Iowa	.50	.50	1.60	1.60	1.60	1.60
			Unwashed ballast .50 ton			
Earlestead (Flint), Mich.	.70		60-40 sieves, .85; Pebbles, .95			
Eau Claire, Wis.	.50	.45	1.25	.95		.90
Elkhart Lake, Wis.		.50			.60	.60
Ft. Dodge, Ia.		1.22		2.17		
Grand Rapids, Mich.		.50		.80		.70
Hamilton, Ohio		.90			.90	
Hawarden, Ia.		.50			1.60	
Hersey, Mich.		.40			.70	
Indianapolis, Ind.	.60	.60		1.50	.75@1.00	.75@1.00
Janesville, Wis.		.65@ .75			.65@ .75	
Mason City, Ia.	.70	.60	1.75		1.70	1.60
Mankato, Minn. (pit run)		.40		.60	1.25	1.3[illegible]
Milwaukee, Wis.		1.11	1.36	1.36	1.36	1.36
Minneapolis, Minn.	.35	.35	1.25@1.35	1.25@1.35	1.25	1.25
Moline, Ill.	1.00	1.00	1.60	1.60	1.60	1.60
Riton, Wis.		.60			.80	
St. Louis, Mo., f.o.b. cars	1.20	1.45	1.65	1.45		1.45
St. Louis, Mo., deliv. on job	2.05	2.20	2.35	2.15		2.10
Summit Grove, Clinton, Ind.	.65@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75	.60@ .75
Terre Haute, Ind.	.75	.75	.75	.75	.75	.75
Waukesha, Wis.	.50	.50	.80	.80	.80	.80
Winona, Minn.	.40	.40	1.25	1.25	1.10	1.10
			(.05 ton discount 10 days)			
SOUTHERN:						
Atlanta, Ga.	.75	.75	.90		.90	.90
Birmingham, Ala.	1.48		all gravel 1.88			
Charleston, W. Va.	all sand 1.40		all gravel 1.50			
Estill Springs, Tenn.	1.35	1.15		1.00	.85	.65
Ft. Worth, Tex.	1.50@2.00	1.50@2.00	1.50@2.00	1.50@2.00	1.50@2.00	1.50@2.00
Jackson's Lake, Ala.	.50@ .60	.50@ .60	.40@1.00	1.00	.50@1.00	.50@1.00
Knoxville, Tenn.	.75@1.00	.75@1.00		1.00@1.50	1.00@1.50	1.00@1.50
Lake Weir, Fla.		.60				
Macon, Ga.		.50@ .75				
Memphis, Tenn.	1.00	1.00	1.80	1.80	1.80	1.80
N. Martinsville, W. Va.	1.00			1.20		.80
New Orleans, La.		.50			1.00	
Roseland, La.	.50		.85	.85		
WESTERN:						
Grand Rapids, Wyo.	.50	.50	.85	.85	.80	.80
Kansas City, Mo.	(Kaw River sand, car lots, .75 per ton. Missouri River, .85)					
Los Angeles, Calif.		.70		1.25	1.05	1.10
Pueblo, Colo.	1.10*	.90*		1.50*		
San Diego, Calif.	.50@ .70	.80@1.00	1.30@1.60	1.35@1.65	1.10@1.40	1.10@1.40
San Francisco, Calif.		1.00	1.00@1.20	.85@1.00	.85@1.00	.85@1.00
Seattle, Wash.	1.00*	1.00*	1.00*	1.00*		1.00*
Spring Valley, Calif.	.70	.80	1.40	1.35	1.25	1.25

Bank Run Sand and Gravel

City or shipping point—	Fine sand, 1/10 inch	Sand, ¼ inch	Gravel, ½ inch	Gravel, 1 inch	Gravel, 1½ inch	Gravel, 2 inch
Atlanta, Ga.	.30@ .40	.30@ .40				
Boonville, N. Y.	.60@ .80		.55@ .75			1.00
Cape Girardeau, Mo.			River sand, 1.00 per yd.			
Cherokee, Iowa			.80 per ton—1.20 washed			
Dudley, Ky. (crushed sand)	1.00	1.00		.90		
East Hartford, Conn.			.65 per cu. yd.			
Elkhart Lake, Wis.	.70	.50			.60	.60
Estill Springs, Tenn.						.85
Fishers, N. Y.		.50@ .65		.50@ .65		
Grand Rapids, Mich.						.50
Hamilton, Ohio			.45 per cu. yd. in pit			
Hartford, Conn.		1.00*				
Hersey, Mich.				.50		
Indianapolis, Ind.			Mixed gravel for concrete work, .65			
Lindsay, Texas					.55	
Janesville, Wis.		.65			.65@ .75	
Montezuma, Ind.			Road gravel .50 per ton			
Pine Bluff, Ark.			Road gravel .50			
Rochester, N. Y.	.60@ .75	.60@ .75			.50@ .65	.50@ .65
Roseland, La.		.75				
Saginaw, Mich., f.o.b. cars		.75	1.30	1.30	1.30	1.30
St. Louis, Mo.			60% gravel, 40% sand, 1.55			
Summit Grove, Ind.	.50	.50	.50	.50	.50	.50
Waco, Texas		.80		1.50		1.30
Winona, Minn.			Clean pit run .60			
York, Pa.		1.00@1.20	(crushed rock sand)			

* Cubic yard. B Bank. L Lake. || Ballast.

Crushed Slag

City or shipping point	Roofing	¼ inch down	½ inch and less	¾ inch and less	1½ inch and less	2½ inch and less	3 inch and larger
EASTERN:							
Buffalo, N. Y.	2.35	1.35	1.35	1.35	1.35	1.35	1.35
E. Canaan, Conn.	4.00	1.00	2.50	1.35	1.25	1.15	1.15
Eastern Pennsylvania and Northern New Jersey	2.00	1.20	1.50	1.20	1.20	1.20	1.20
Easton, Pa.	2.50	.80	1.25	.90	.85	.80	.80
Erie, Pa.	2.35	1.35	1.35	1.35	1.35	1.35	1.35
Emporium, Pa.			1.35	1.35	1.35	1.35	1.35
Sharpsville and West Middlesex, Pa.	2.00	1.30	1.70	1.30	1.30	1.30	1.30
Western Pennsylvania	2.00	1.25	1.50	1.25	1.25	1.25	1.25
CENTRAL:							
Chicago, Ill.			All sizes, 1.50, F.O.B. Chicago				
Detroit, Mich.			All sizes, 1.65, F.O.B. Detroit				
Ironton, O.	2.05	1.45	1.80	1.45	1.45	1.45	1.45
Steubenville, O.	2.00	1.40	1.70	1.40	1.40	1.40	1.40
Toledo, O.	1.75	1.50	1.50	1.50	1.50	1.50	1.50
Youngstown, Dover, Hubbard, Leetonia, Struthers, O.	2.00	1.25	1.50	1.25	1.25	1.25	1.25
Steubenville, Lowellville and Canton, O.	2.00	1.35	1.60	1.35	1.35	1.35	1.35
SOUTHERN:							
Ashland, Ky.		1.55		1.55	1.55	1.55	1.55
Birmingham, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Ensley, Ala.	2.05	.80	1.25	1.15	1.10	.95	.85
Longdale, Goshen, Glen Wilton & Low Moor, Roanoke, Va.	2.50	1.00	1.25	1.25	1.25	1.15	1.05

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

	Finishing Hydrate	Masons' Hydrate	Agricultural Hydrate	Chemical Hydrate	Ground Burnt Lime Blk.	Ground Burnt Lime Bags	Lump Lime Blk.	Lump Lime Bbl.
EASTERN								
Adams, Mass.			7.00				2.90	
Bellefonte, Pa.		10.50§	10.50§	10.50§	9.00		8.50	1.80
Buffalo, N. Y.		12.00		12.00				
Berkley, R. I.			12.00					2.30
Cassadaga, N. Y.			Agricultural marl 7.00@10.00					
Chaumont, N. Y.					2.50	4.00		
Lime Ridge, Pa.							5.00	
West Rutland, Vt.	13.50	12.00					11.00	3.20
West Stockbridge, Mass.								2.25
Williamsport, Pa.			10.00			10.00	6.00	
York, Pa. (dealers' prices)		10.50	10.50				10.50	1.65*
Zylonite, Mass.	3.20d	2.90d	7.00					
CENTRAL:								
Cold Springs, Ohio		10.00	10.00				9.00	
Delaware, Ohio	11.50	10.00	9.50	10.50			9.00	1.60
Gibsonburg, Ohio	11.50		10.00		8.00	10.00	9.00	
Huntington, Ind.		10.00					9.00	
Luckey, Ohio	11.50	10.00	10.00					
Marblehead, Ohio		10.00					9.00	1.60
Marion, Ohio		10.00	10.00				9.00	
Mitchell, Ind.				12.00	11.00		10.00	1.60
Sheboygan, Wis.								7.50d
White Rock, Ohio	11.50				8.00	10.00		
Woodville, O. (dlrs.' price)	11.50a	10.00a	10.00a	11.00a			9.00	1.60
SOUTHERN:								
Erin, Tenn.							8.50	1.50
El Paso, Tex.							7.00	1.50
Karo, Va.							7.00	1.30
Knoxville, Tenn.	18.00	11.00@12.00		11.00@12.00	10.00	11.00	8.50	1.50
Ocala and Zuber, Fla.	13.00		12.00				12.00	1.60
Sherwood, Tenn.	12.50	11.00		8.50			8.50	1.50
Staunton, Va.					4.50	5.50	8.50	1.35
WESTERN:								
Colton, Calif.			15.00				19.70	
Kirtland, N. M.							12.50	
San Francisco, Calif.	21.00	21.00	15.00	21.00			15.00	2.15*
Tehachapi, Calif.							13.00	2.00

$100-lb. sacks; *180-lb. net, price per barrel; †180-lb. net, non-returnable metal barrel; §Paper sacks. (a) 50-lb. paper bags; terms, 30 days net; 25c per ton or 5c per bbl. discount for cash in 10 days from date of invoice. (b) Burlap bags. (c) 200-lb. bbl. (d) 280-lb. bbl. net.

Miscellaneous Sands

(Continued from preceding page)

Delaware, N. J.—Molding fine	2.00
Molding coarse	1.90
Brass molding	2.15
Dunbar, Pa.—Traction, damp	2.50
Dundee, O.—Glass, core, sand blast, traction	2.50
Molding fine, brass molding (plus 75c for winter loading)	2.00
Molding coarse (plus 75c for winter loading)	1.75
Eau Claire, Wis.—Core	1.00@1.25
Sand blast	3.25@3.75
Falls Creek, Pa.—Molding, fine and coarse	1.75
Sand blast	2.00
Traction	1.75
Franklin, Pa.—Core	1.25@1.75
Furnace lining	2.50
Molding fine	2.00
Molding coarse	1.75
Brass molding	2.00
Greenville, Ill.—Molding coarse	1.75@2.00
Joliet, Ill.—No. 2 molding sand and loam for luting purposes; milled	.80
Bank run	.65
Kansas City, Mo.—Missouri River core	.80
Kasota, Minn.—Stone sawing	1.30@1.50
Klondike, Pacific, Gray Summit, Mo.—Molding fine and coarse	2.00
Molding fine	2.00
Mapleton, Pa.—Glass, core, furnace lining, molding fine and coarse; damp 2.00, dry	2.75
Massillon, O.—Molding fine and coarse, furnace lining, core	2.75
Brass molding	3.00
Traction	2.50
Michigan City, Ind.—Core, traction.	.40@ .45
Mineral Ridge, Ohio—Core, brass molding (green)	2.00
Furnace lining, molding fine and coarse; roofing sand, sand blast, stone sawing (green)	1.75
Traction (green)	1.85
Sand blast (dry)	2.75
Montoursville, Pa.—Core	1.25@1.35
Traction	1.00
Molding fine	1.50
Molding coarse	1.50@2.00
New Lexington, O.—Molding fine	2.00
Molding coarse	1.75
(.75 extra per ton for winter loading)	
Oregon, Ill.—Core	1.50@2.00
Sand blast	3.50@4.00
Stone sawing	2.00@2.50
Ottawa, Ill.—Core, molding, steel, traction, roofing sand	2.00
Brass molding	3.00
Sand blast	4.00
Stone sawing	3.50
Furnace lining, molding coarse (crude)	1.25@1.50
Ottawa, Minn.—All crude silica sand	.75@1.00
Rockwood, Mich.—Core	1.90
Roofing	3.00
Sand blast	3.75
Round Top, Md.—Glass sand	1.75@2.00
Core, furnace lining	1.45
Traction	1.60

(All per 2000 lb.)

Miscellaneous Sands

(Continued)

San Francisco, Cal. (Washed and dried)—Core, molding fine, roofing sand and brass molding	3.00@3.50
Direct from pit.	
Furnace lining, molding coarse, sand blast	3.60
Stone sawing, traction	2.30
Thayers, Pa.—Core and traction	2.00
Furnace lining	1.25
Molding fine and coarse	1.25
Utica, Ill.—Core	75@1.50
Furnace lining	1.00@1.50
Molding coarse	.85
Stone sawing	.85
Molding fine	.75
Utica, Pa.—Core	1.25@2.25
Molding fine and coarse, traction, brass molding	2.00
Warwick, Ohio—Core, furnace lining, molding coarse; green, 2.00; dry	2.50
Molding fine, traction, dry	2.50
Brass molding fine	2.25
Zanesville, Ohio—Core	2.25
Furnace lining	2.00
Molding fine	1.75@2.00
Molding coarse	1.50@1.75
Steel molding	1.75@2.00

Talc

Prices given are per ton f. o. b. (in carload lots only) producing plant, or nearest shipping point.

Baltimore, Md.—Ground talc (20-50 mesh), bags	10.00
Ground talc (150-200 mesh), bags	12.00
Cubes	50.00
Blanks (per lb.)	.07
Chatsworth, Ga.—Grinding	6.00
Ground talc (150-200 mesh); bags	15.00
Pencils and steel workers' crayons (gross)	1.50@ 2.50
Chester, Vt.—Crude talc	5.00
Ground talc (150-200 mesh), bulk	6.50@ 8.50
Emeryville, N. Y.—200-325 mesh; (double air floated), bags	14.75
Glendale, Calif.—Ground talc (150-200-mesh)	16.00@30.00
(Bags extra)	
Ground talc (50-300 mesh)	13.50@15.50
200 mesh	13.50@14.50
Hailesboro, N. Y.—Ground talc (150-250 mesh), bags	18.00
Henry, Va.—Crude talc (lump mine run) per 2000-lb. ton	2.75@ 3.50
Ground talc (20-50 mesh), bags	8.75@10.00
(150-200 mesh), bags	9.75@12.50
Los Angeles, Calif.—Ground talc (200 mesh) (includ. bags)	16.00@20.00
Mertztown, Pa.—Ground talc (20-50 mesh); bulk, 5.00; bags	6.00
(150-200 mesh); bulk, 7.00; bags	8.00
Natural Bridge, N. Y.—Ground talc (150-200 mesh) bags	12.00@13.00
Rochester and East Granville, Vt.—Ground talc (20-50 mesh), bulk	8.50@10.00
(Bags extra)	
Ground talc (150-200 mesh), bulk	10.00@22.00
(Bags extra)	
Vermont—Ground talc (20-50 mesh); bags	7.50@10.00
Ground talc (150-200 mesh); bags	8.50@15.00
Waterbury, Vt. — Ground talc (20-50 mesh), bulk	7.50
(Bags 1.00 extra)	
Ground talc (150-200 mesh), bulk	9.00@14.00
(Bags 1.00 extra)	
Pencils and steel workers' crayons, per gross	1.20@ 2.00

Rock Phosphate

Raw Rock

Per 2240-lb. Ton

Centerville, Tenn—B.P.L. 72% to 75%	6.00@8.50
B.P.L. 65%	6.00
Gordonsburg, Tenn.—B.P.L. 68%-72%	4.25@5.00
Tennessee—F. o. b. mines, long tons, unground Tenn. brown rock, 72% B. P. L.	7.00
Mt. Pleasant, Tenn.—Analysis, .65-.70% B.P.L. (2000 lb.)	6.00@6.50
Paris, Idaho.—2000 lb. mine run, B.P.L. 70%	3.25

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Gray Roofing Slate, f. o. b. cars quarries:

Sizes	Genuine Bangor, Washington Big Bed, Franklin Big Bed	Genuine Albion	Slatington Small Bed	Genuine Bangor Ribbon
24x12	$10.20	$8.40	$8.10	$7.50
24x14	10.20	8.40	8.10	7.50
22x12	10.80	8.70	8.40	7.80
22x11	10.80	8.70	8.40	7.80
20x12	12.60	9.00	8.70	8.10
20x10	12.60	9.00	8.70	8.10
18x10	12.60	9.00	8.70	8.10
18x 9	12.60	9.00	8.70	8.10
16x10	12.60	8.70	8.40	7.80
16x 9	12.60	8.70	8.40	7.80
16x 8	12.60	8.70	8.40	7 80
18x12	12.60	9.00	8.70	8.10
16x12	12.60	8.70	8.40	7.80
14x10	11.10	8.40	8.10	7.50
14x 8	11.10	8.40	8.10	7.50
14x 7 to 12x6	9.30	8.10	7.50	7.50
	Mediums	Mediums	Mediums	Mediums
24x12	$ 8.10	$8.10	$7.20	$5.75
22x11	8.40	8.40	7.50	5.75
Other sizes	8.70	8.70	7.80	5.75

For less than carload lots of 20 squares or under, 10% additional charge will be made.

(Continued from preceding page)

Ground Rock

Wales, Tenn.—B.P.L. 70%	7.75
Per 2000-lb. Ton	
Barton, Fla. — Analysis, 50% to 65% B.P.L.	3.50@8.00
Centerville, Tenn.—B.P.L., 60-65%	5.00@6.00
B.P.L. 75% (brown rock)	12.00
Columbia, Tenn.—B.P.L. 68% to 72%	5.50
B.P.L. 65% (90% thru 200 mesh) bulk	5.50
Montpelier, Idaho — Analysis, 72% B.P.L., crushed and dried	3.75
Mt. Pleasant, Tenn.—B.P.L. 65%	5.50
Twomey, Tenn.—B.P.L. 65%	6.50

Florida Soft Phosphate

Raw Land Pebble

Per Ton	
Florida—F. o. b. mines, long ton, 68/66% B.P.L.	3.00
68% (min.)	3.25
70% (min.)	3.50
Jacksonville (Fla.) District	10.00@12.00

Ground Land Pebble

Per Ton	
Jacksonville (Fla.) District	14.00
Add 2.50 for sacks.	
Morristown, Fla.—26% phos. acid	16.00
Mt. Pleasant, Tenn.—65-70% B.P.L.	5.00@ 6.00

Fluorspar

Fluorspar — 80% and over calcium fluoride, not over 5% silica; per ton f. o. b. Illinois and Kentucky mines	20.00
Fluorspar—85% and over calcium fluoride, not over 5% silica; per ton f. o. b. Illinois and Kentucky mines	21.50

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

City or shipping point	Terrazzo	Stucco chips
Chicago, Ill.—Stucco chips, in sacks f.o.b quarries		17.50
Deerfield, Md. — Green; bulk	7.00	7.00
Easton, Pa.—Evergreen, creme green and royal green marble	10.00@16.00	14.00@20.00
* Slate granules		7.00@ 7.50
Granville, N. Y. — Red slate granules		7.50
Harrisburg, Va.—Black marble, bulk		12.50
Ingomar, Ohio	10.00@12.00	10.00@25.00
Milwaukee, Wis.		20.00@35.00
New York, N. Y.—Red and yellow Verona		32.00
Middlebrook, Mo.—Red		25.00@30.00
Phillipsb'g, N. J.—Green stucco dash	20.00@22.00	16.00@20.00
Poultney, Vt.—Slate granules		7.50
Red Granite, Wis.		7.50
Sioux Falls, S. D.	7.50	7.50
Tuckahoe, N. Y.		5.00@12.00
Whitestone, Ga.—White marble chips, net ton in bulk, f.o.b., bags		
15c extra	4.50	4.50

Concrete Brick

Prices given per 1,000 brick, f. o. b. plant or nearest shipping point.

	Common	Face
Appleton, Minn.	20.00	25.00@35.00
Birmingham, Ala.	13.30	21.75
Carpenterville, N. J.	16.00	31.50@40.00
Easton, Pa.	16.00	40.00@60.00
Eugene, Ore.	25.00@26.00	50.00@75.00
Friesland, Wis.	23.00@24.00	30.00@35.00
Houston, Tex.		19.50
Omaha, Neb.	16.00	30.00@40.00
Portland, Ore. (Del'd)	21.00	45.00@60.00
Puyallup, Wash.	20.00	40.00@75.00
Rapid City, S. D.	18.00	25.00@45.00
St. Paul, Minn.	15.00	30.00@35.00
Salem, Ore.	25.00	35.00@50.00
Salt Lake City, Utah	17.00@18.00	35.00@40.00
Springfield, Ill.	18.00	20.00@25.00
Wauwatosa, Wis.	13.00@14.00	27.00@65.00
Watertown, N. Y.	18.00	35.00
Winnipeg, Can.	18.00	26.00

Sand-Lime Brick

Prices given per 1,000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

Barton, Wis.	10.50
Boston, Mass.	15.00
Buffalo, N. Y.	16.50
Dayton, Ohio	12.50@13.50
El Paso, Texas	13.00
Grand Rapids, Mich.	11.50
Lancaster, N. Y.	14.00
Michigan City, Ind.	11.00
Milwaukee, Wis. (delivered)	14.00
Minneapolis, Minn.	13.00
Plant City, Fla.	10.00
Redfield, Mass.	15.00
Rives Junction, Mich.	11.00
Saginaw, Mich.	11.00
San Antonio, Texas—Common	15.00
South Dayton, Ohio	12.50@13.50
Syracuse, N. Y. (delivered at job)	18.00
f.o.b. cars	16.00
Washington, D. C.	14.50

Lime

Warehouse prices, carload lots at principal cities.

	Hydrate per Ton	
	Finishing	Common
Atlanta, Ga.	23.00	20.00
Baltimore, Md.	22.00	16.25
Cincinnati, Ohio	15.80	13.30
Chicago, Ill.	18.00	18.00
Dallas, Tex.	22.50	.....
Denver, Colo.	24.00	.....
Detroit, Mich.	19.50	17.50
Kansas City, Mo.	25.60	24.00
Minneapolis, Minn. (white)	25.50	21.00
Montreal, Que.	21.00	21.00
New Orleans, La.	.....	17.25
New York, N. Y.	16.80	13.10
Philadelphia, Pa.	15.50	14.50
St. Louis, Mo.	21.40	19.20
San Francisco, Calif.	22.00	16.00
Seattle, Wash. (paper sacks)	24.00	.....

	Lump per 180-lb. Barrel (net)	
	Finishing	Common
Atlanta, Ga.	2.25†	1.85†
Cincinnati, Ohio	.....	10.75‡
Chicago, Ill.	1.50†	1.40†
Dallas, Tex.	.....	2.50†
Denver, Colo.	.....	2.70†
Detroit, Mich.	.....	18.25‡
Kansas City, Mo.	2.40†	2.40†
Minneapolis, Minn.	1.55†	1.40†
Montreal	15.00‡	11.00‡
New Orleans, La.	2.40†	.....
New York, N. Y.	3.75*	3.00@3.25*
Philadelphia, Pa.	13.00‡	12.00‡
St. Louis, Mo.	17.75	17.75‡
San Francisco, Calif.	.....	1.75†
Seattle, Wash.	2.80†	.....

*Per 280 lb. bbl. (net). †Per 180-lb. bbl. (net). ‡Per ton. Refund of 10c per bbl. Minneapolis quotes brown common lump lime: Kelly Island white is $1.55, Sheboygan $1.45. New York quotes hydrated lime "on cars" in paper sacks; lump lime "alongside dealers' docks" or "on cars."

Portland Cement

Current prices per barrel in carload lots, f. o. b. cars, without bags.

Atlanta, Ga.	2.80
Boston, Mass.	3.03
Cedar Rapids, Iowa	2.48
Cincinnati, Ohio	2.54
Cleveland, Ohio	2.46
Chicago, Ill.	2.20
Dallas, Tex.	2.25
Davenport, Iowa	2.43
Denver, Colo.	2.65
Detroit, Mich.	2.47
Duluth, Minn.	2.14
Indianapolis, Ind.	2.41
Kansas City, Mo.	2.45
Los Angeles, Calif.	2.56
Milwaukee, Wis.	2.37
Minneapolis, Minn.	2.39
Montreal, Can. (sacks 20c extra)	2.40
New Orleans, La.	2.83
New York, N. Y.	2.70
Phoenix, Ariz.	3.70
Pittsburgh, Pa.	2.24
Portland, Ore.	3.05
St. Louis, Mo.	2.35
St. Paul, Minn.	2.39
Toledo, Ohio	2.48
Seattle, Wash.	2.90

NOTE—Add 40c per bbl. for bags.

Gypsum Products— CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

	Crushed Rock	Ground Gypsum	Agricultural Gypsum	Stucco* Calcined Gypsum	Cement‡ and Gauging Plaster	Wood Fiber	White§ Gauging	Sanded Plaster	Keene's Cement	Trowel Finish	Plaster Board ¼x32x36" Weight 1500 lb. Per M Sq. Ft.	Plaster Board ⅜x32x36" Weight 1850 lb. Per M Sq. Ft.	Wallboard, ⅜x32 or 48" Lengths 6'-10', 1850 lb. Per M Sq. Ft.
Douglas, Ariz.	.....	6.00	6.00	.....	13.00	.....	.....	.....	.....	.....	.....	.....	.....
Fort Dodge, Iowa	3.00	3.50	6.00	8.00	10.00	10.50	20.00	.....	21.30	20.00	20.00	.....	30.00
Garbutt, N. Y.	.....	.....	6.00	8.00	10.00	10.00	.....	7.00	.....	.....	.....	20.00	.....
Grand Rapids, Mich.	3.00	.....	5.00	10.00	10.00	10.00	.....	.....	31.00	.....	19.75	20.00	30.00
Hanover, Mont.	4.50	.....	6.00	10.00	.....	10.50	.....	.....	.....	.....	.....	.....	.....
Mound House, Nev.	.....	8.50	6.50	10.50@11.50	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oakfield, N. Y.	3.00	4.00	6.00	8.00	10.00	10.00	20.20	7.00+	30.75	21.00	19.375	20.00	30.00
Rapid City, S. D.	4.00	.....	.....	10.00	12.00	12.50	.....	.....	33.75	.....	.....	.....	.....
Winnipeg, Man.	5.50	5.50	7.00	13.50	15.00	15.00	.....	.....	.....	.....	28.50	.....	35.00

NOTE—Returnable Jute Bags, 15c each, $3.00 per ton; Paper Bags, $1.00 per ton extra.
*Shipment in bulk 25c per ton less; ‡Bond plaster $1.50 per ton additional; +Sanded Wood Fiber $2.50 per ton additional; §White Moulding 50c per ton additional; ||Bulk; (a) Includes sacks.

News of All the Industry

Incorporations

The Forest Hill Gravel Co. has been incorporated at Forest Hill, Fla.

The Toronto Cement Corp. Ltd., Toronto, has been incorporated for $3,000,000.

The Superior Cement Stucco Co., Los Angeles, Calif., has been incorporated for $20,000.

The Reliable Cement Products Co., Cleveland, Ohio, has been incorporated for $50,000 by F. H. Kuhn and J. Joseph.

The Commonwealth Mica Co., Wilmington, Del., has been incorporated for $1,000,000 to manufacture mica products.

The Southern Cement Products Co., San Antonio, Tex., has been incorporated for $25,000 by H. Ferrin, C. K. Brown, J. G. Boone.

The New River Sand and Gravel Co. has been incorporated in Huntington, W. Va., for $50,000, by A. Irwin, F. Pike, Huntington; R. T. Thrift, Charleston.

The Genesee Feldspar Co., Rochester, N. Y., has been incorporated for $100,000 to operate a feldspar mill. Incorporators are S. R. Parry, W. C. Fredericks, G. E. Worth, Rochester.

The U. S. Potash Corp. has been incorporated to operate a plant near Marysvale, Utah. Incorporators are F. B. W. Schoradt, C. H. Hinzel, G. U. Preuss, Dr. M. F. Babenzin, Brooklyn, N. Y., and C. A. Valentine, Salt Lake City, Utah.

The Newburgh Lime Mfg. Co., Newburgh, N. Y., has been incorporated for $20,000 to manufacture lime products. Incorporators are W. C. Martin, M. Gorchoff, A. Lechman, Newburgh. J. V. McKee, 51 Chambers street, New York City, is the representative.

Cement

The Texas Portland Cement Co., Dallas, Tex., has increased its capital stock from $1,000,000 to $2,000,000.

The Acme Cement and Plaster Co., St. Louis, Mo., has increased its capital stock from $1,000,000 to $2,000,000.

The Marquette Cement Manufacturing Co., La Salle, Ill., has increased its capital stock from $700,000 to $7,000,000.

The Alpha Portland Cement Co., Bellevue, Mich., will continue running to full capacity this winter, only shutting down for a short time this spring for repairs.

The State Cement Commission of South Dakota, A. C. Hunt, secretary, has purchased a tract of land at Rapid City and will soon begin construction of its plant.

The Signal Mountain Portland Cement Co., Chattanooga, Tenn., has elected the following: J. L. Senior, president; C. S. Steward, vice-president; R. A. Law, secretary; J. P. Hoskins, treasurer.

The Cape Girardeau Portland Cement Co., Cape Girardeau, Mo., reports that recently its shipment for one day reached 12 carloads. This is the largest shipment made in one day for several months.

Spokane, Wash.—E. B. Sherman, mayor of Boise, Idaho, and other Idaho men, have incorporated a $2,000,000 corporation to manufacture cement in Oregon, near Huntington. The corporation will be known as the Columbia Cement Co., organized in Nevada. The company has 500 acres of ground and the plant will have a capacity of 1500 bbl. a day.

The Portland Cement Association announces the opening of a new district office, effective February 1, in the Hibernia Bank building, New Orleans. This increases the list of association district offices to 25. Association work in Louisiana and Mississippi will be directed from this office. The district engineer in charge of the New Orleans office is John E. Tate, formerly of the Atlanta office as field engineer in North Carolina. Prior to joining the association staff, he was for two years resident engineer with the Road Commission of Maryland, and for three years assistant engineer, Delaware Highway Department.

Quarries

The Andres Stone and Marble Co., Milwaukee, Wis., has increased its capital stock from $300,000 to $600,000.

The Consolidated Stone and Mining Co., New Castle, Pa., has added to its equipment a No. 3 Clyde lime hydrator.

Dallas, Texas—The U. S. Graphite Co. is making plans to resume operations at its large graphite mines at La Colorado.

Los Angeles, Calif.—The Minarock Products Co. will build a large rock-crushing plant here representing an investment of $75,000.

Evansville, Ind.—Roy Sampson, representative of the Natural Rock Asphalt Corp. of Kentucky, announces that the corporation has opened mines near Glenmore, Ky.

Martinsville, Ind.—Karl Nutter, Martinsville, has purchased a site for a stone company northwest of Bloomington for $35,000, and plans to operate a stone quarry.

Okmulgee, Okla.—The Oklahoma Stone Co. announces that it will soon operate quarries southeast of Okmulgee. Those interested in the project are W. L. Hamilton, W. E. Javell, C. B. Hanes and J. R. Jones.

The Blue Diamond Plaster Co., Corona, Calif., is experiencing the greatest activity since its organization eight years ago. The company is working day and night. Between 50 and 75 cars of rock are being shipped daily.

Waterloo, Ill.—The Columbia Quarry Co. will begin the opening of a quarry at Chester, which is expected to be operating on a large scale by April. This will be the sixth quarry operated by the company, and probably the largest.

The Chickamauga Quarry and Construction Co. will begin operations at its Graysville, Ga., plant about February 1. The new quarry represents an investment of about $60,000. It will have a capacity of 500 tons of stone daily.

The Anna Stone Co., Anna, Ill., is installing new crushing machines to take care of its business temporarily. The new machines have a capacity of 700 tons daily. Excavations for the new plant are being made; it will have a capacity of 3000 tons daily of crushed stone and 500 tons of agricultural limestone.

Sand and Gravel

The Midland Gravel Co., Midland, Mich., has increased its stock from $100,000 to $150,000.

The Sand and Gravel Production Co., Detroit, Mich., has been incorporated for $90,000.

The Badger Sand and Gravel Co., New Butler, Wis., has increased its capital from $25,000 to $50,000.

The Hugger Brothers Gravel Co., Montgomery, Ala., has changed its name to the Alabama Sand and Gravel Co.

The Southern Sand Co., Little Rock, Ark., has increased its capital stock from $50,000 to $150,000.

The Harston Sand and Gravel Co. has been incorporated at Dallas, Texas, for $120,000, by D. S. Harston, W. E. Callahan, J. H. Smith.

The Silica Sand plant of the Everhard Co., Massillon, Ohio, was destroyed by fire recently, with a loss of $75,000. The company will at once rebuild a modern plant of larger capacity.

The Albany Gravel Co., Inc., Albany, N. Y., has leased the Van Rensselaer sand and gravel bank. The bank is being equipped with a $30,000 washing and screening plant. Richard Hopkins, president.

Lincoln, Ill.—The McGrath Sand and Gravel Co. has purchased the plant of the Peoria Washed Sand and Gravel Co. Elwood Bienemann, the present manager, will remain in charge. The McGrath company now operates six plants.

The Wilson Sand and Supply Co., Huntington, W. Va., has been purchased by G. A. Northcott for $50,000. The company has been operating since 1902 and has five plants. Mr. Northcott announces that the plant will be enlarged shortly.

Manufacturers

H. G. Horton of the explosives department of the du Pont Co. has been named as Western representative of the Contractors' Division of that department, with headquarters in the McCormick building, Chicago.

The Standard Conveyor Co. announces that it has acquired the rights and patents to the Brown line of portable and sectional piling, elevating, conveying, loading and unloading machinery. This line has been manufactured by the Brown Portable Conveying Machinery Co., at North Chicago, for 10 years. Until further notice the plant will be continued in operation by the Standard company, and correspondence should be addressed to this company.

Robert W. Hunt & Co., inspecting, testing and consulting engineers, announce the appointment of D. B. Rush, manager of the cement department, at their general office, Chicago. Mr. Rush is a graduate of Rose Polytechnic Institute, with the degrees of B.S., M.S. and C.E., and is a licensed structural engineer. He has been associated with this company's engineering department for the past four years, and prior to that time was successively employed by the engineering department of the Chicago & Alton Railroad, Horace G. Burt, civil engineer; W. F. M. Goss, railway engineer; the late John F. Wallace, and Bion J. Arnold.

The Dodge Sales and Engineering Co., Mishawaka, Ind., for the past eight years operating as selling subsidiary of the Dodge Mfg. Co. and Dodge Steel Pulley Corp., has been consolidated with the Dodge Mfg. Corp. The Dodge Steel Pulley Corp. organized in 1917 as the successor of the Oneida Steel Pulley Co., which began making steel pulleys in 1900. Since July, 1922, the manufacture of Dodge, Oneida and Keystone power transmission appliances and Dodge heavy-oil engines has been conducted by the Dodge Mfg. Corp. The distribution of Dodge products will hereafter be conducted by the sales department of the Dodge Mfg. Corp., with Duncan J. Campbell, general sales manager. The district sales organization of the Dodge Sales and Engineering Co. will be continued as branches of the sales department of the corporation. Their activities will be considerably increased and the service to dealer and consumer from branch warehouse stocks will be kept up to a high standard of efficiency. The Dodge Mfg. Corp. also controls the Dodge Mfg. Co. of Canada, Ltd., with head offices and works at Toronto, Ontario, and sales office at Montreal, Que.

Pennsylvania Crusher Co. Opens Chicago Branch.—The increasing demand from cement, gypsum, lime, and crushed stone plants for single roll and hammer crushers made by the Pennsylvania Crusher Co. has resulted in its opening an additional branch at Chicago. Philadelphia has been its headquarters for 20 years, and branches at New York and Pittsburgh have supplemented the work of the main office in supplying stone and coal crushing machinery to Eastern purchasers. A growing demand among Western producers has made necessary the Chicago branch in order to better serve these users of Pennsylvania products. In charge of the Chicago branch is C. S. Darling, who is well known to a large number of producers in the non-metallic mineral industries as editor of "Rock Products" during the past year. Mr. Darling is an engineering graduate of the Worcester Polytechnic Institute, and during the World War he served in France as captain in the 108th U. S. Engineers. Single roll crushers for primary breaking and hammer crushers for secondary crushing as manufactured by the company have been operating successfully under severe conditions for a score of years in cement, gypsum, lime, flux, and other stone crushing plants. Machinery for coal crushing has been one of its principal products. In addition to hammer and single roll crushers, this machinery includes Bradford breakers for the initial crushing of mine run coal. Pennsylvania coal crushing machinery is widely used in cement plants for the preparation of stoker feed and for the initial breaking of coal, preparatory to pulverizing for rotary kiln feed. The Chicago office of the Pennsylvania Crusher Co. will be in the Monadnock block until May 1, after which time it will be located in the new Illinois Merchants' Bank building.

STURTEVANT

MOTO-VIBRO SCREEN

ABOUT 1/2 THE PRICE OF OTHERS

And With No Sacrifice to Quality, Accessibility, Accuracy or Capacity

In fact, it is a superior screen in every respect.

Its vibration is better than the best of others, because it is evenly distributed and uniform in its

STINGING INTENSITY

yet noiseless, non-destructive and does not require dangerous wire stretching or disastrous flexing.

All auxiliaries, motor-generators, complications, delicate adjustments, and obstructions on Screens are eliminated.

It is truly a simple Screen of Unit construction, one, two or three Screens per Unit, all accessible through a light, strong "open door." Simple, easily covered frames of convenient size, all interchangeable, scalper in cover, none fastened and all readily removed.

Screens anything screenable, coarse or fine.

SOLD ON TRIAL

STURTEVANT MILL CO. HARRISON SQUARE Boston, Mass.

The Sign of Service!

SAND: GRAVEL: STONE

THE National Sand and Gravel Association renders members definite service along the lines of car supply, income tax, such traffic and transportation matters as may properly come before it. It promotes the use of the industry's materials.

Quite unsolicited letters from members indicate the dollars-and-cents value to them of National Association service.

Special information by wire and letter and transmission to members, upon request, of accurate and definite statements, capable of instant use by business men, concerning action on bills in Congress, court decisions, rulings and other information emanating from governmental bureaus, departments and commissions.

National Sand and Gravel Association

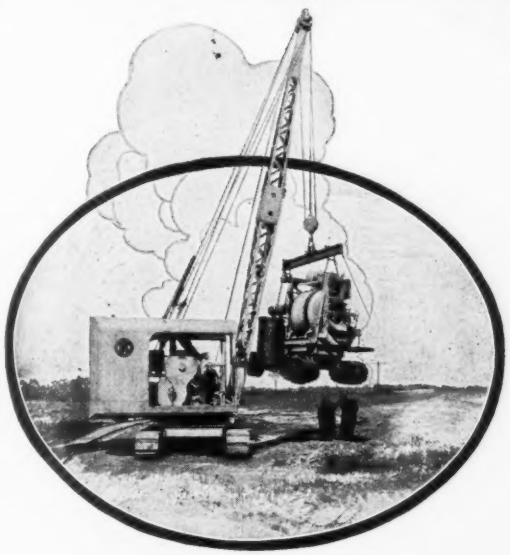
T. R. BARROWS, Executive Secretary

Suite 903, Munsey Building **Washington, D. C.**

KOEHRING

Crane Excavator

Quickest Changeability Greatest Flexibility



TWO line speeds from two independently controlled drums. Change from dragline to clamshell work, merely by shifting a clutch! No gearing to replace. As quickly changed into power shovel—easily changed for pile driver and magnet.

A lever for every function

No double function levers. Combine any functions at will as a time-saving practice. The Koehring is designed for it. No penalty of excess wear.

Koehring "heavy duty" construction means the utmost of safety-margin against breakdowns and delays, the utmost of trouble-free service life.

Write for Koehring Crane Catalog No. 29 today.

No. 2 Capacity: 12 tons at 12′ radius. ½ yard clamshell bucket loaded with sand or gravel at 45′ radius. ¾ yard clamshell bucket loaded with sand or gravel at 39′ radius. 1 yard clamshell bucket loaded with sand or gravel at 33′ radius. 1½ yard clamshell bucket loaded with sand or gravel at 24′ radius. 1 yard Page drag bucket on a 40′ boom.

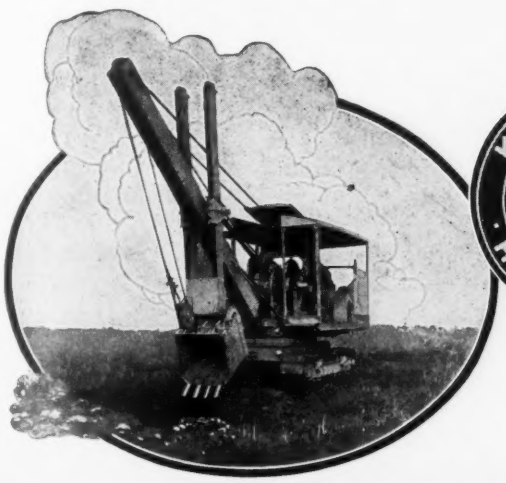
No. 3 Capacity: 20 tons at 12′ radius. 1 yard clamshell bucket loaded with sand or gravel at 50′ radius. 1½ clamshell bucket loaded with sand or gravel at 39′ radius. 2 yard clamshell bucket loaded with sand or gravel at 33′ radius. 1½ yard Page drag bucket at 40′ radius.

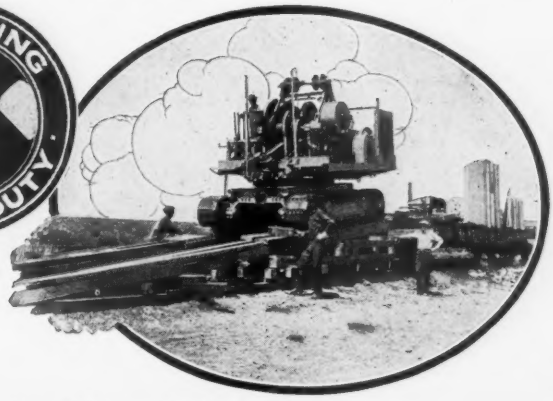
No. 1 Capacity: Equipped with 30′ boom. Handles ¾ yard bucket at 25′ radius; lifting capacity at 12′, 14,000 lbs. 4 cylinder 5″ x 6″ gasoline engine.

KOEHRING COMPANY

MANUFACTURERS OF CONCRETE MIXERS AND CRANE EXCAVATORS

MILWAUKEE, WISCONSIN





Buyers' Directory
of the Rock Products Industry

Classified Directory of Advertisers in this issue of Rock Products

AERIAL TRAMWAYS
Interstate Equip. Co., New York, N. Y.

AUTOMATIC WEIGHERS
Richardson Scale Co., Passaic, N. J.
Schaffer Eng. & Equipment Co., Pittsburgh, Pa.

BAGS AND BAG MACHINERY
Jaite Co., The, Jaite, Ohio

BELTING
Robins Conveying Belt Co., New York City, N. Y.

BINS
Austin Mfg. Co., Chicago, Ill.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Link-Belt Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill. (storage).

BIN GATES
Allis-Calmers Mfg. Co., Milwaukee, Wis.
Austin Mfg. Co., Chicago, Ill.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Link-Belt Co., Chicago, Ill.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

BLASTING SUPPLIES
Hercules Powder Co., Wilmington, Del.

BOILERS, WASTE HEAT
Edge Moor Iron Co., Edge Moor, Del.
Freeman Mfg. Co., Racine, Wis.

BUCKETS—Elevator
Austin Mfg. Co., Chicago, Ill.
Brown Hoisting Machinery Co., Cleveland, Ohio.
Hendrick Mfg. Co., Carbondale, Pa.
Link-Belt Co., Chicago, Ill.
Orton & Steinbrenner, Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.

BUCKETS, GRAB
Brown Hoisting Machinery Co., Cleveland, Ohio.
McMyler Interstate Co., Cleveland, Ohio.

CABLEWAYS
Interstate Equip Co., New York, N. Y.
Link-Belt Co., Chicago, Ill.

CALCINING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio.
Butterworth & Lowe, Grand Rapids, Mich.

CARS—Quarry and Industrial
Atlas Car & Mfg. Co., Cleveland, Ohio.
Western Wheeled Scraper Co., Aurora, Ill.

CAR PULLERS
Link-Belt Co., Chicago, Ill.
Mining Machine Co., Mountville, Pa.
Weller Mfg. Co., Chicago, Ill.

CEMENT MACHINERY
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City.

CHAIN
Carroll Chain Co., Columbus, Ohio.
Moore & Moore, Inc., Reading, Pa.
Morse Chain Co., Ithaca, N. Y.

CLUTCHES
Dodge Mfg. Co., Mishawaka, Ind.
Link-Belt Co., Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

CONVEYORS AND ELEVATORS
Jeffrey Mfg. Co., Columbus, Ohio.
Kennedy-Van Saun Mfg. & Eng. Corp., New York City.
Link-Belt Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Robins Conveying Belt Co., New York City.
Sturtevant Mill Co., Boston, Mass.
Universal Road Mach. Co., Kingston, N. Y.
Webster Mfg. Co., Chicago, Ill.

CRANES—Crawling Tractor
Industrial Works, Bay City, Mich.

CRANES—Locomotive Gantry
Brown Hoisting Machinery Co., The, Cleveland, Ohio.
Byers Mach. Co., The, Ravenna, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Industrial Works, Bay City, Mich.
Koehring Co., Milwaukee, Wis.
Link-Belt Co., Chicago, Ill.
McMyler-Interstate Co., Cleveland, Ohio.
Northwest Engineering Co., Chicago, Ill.
Ohio Locomotive Crane Co., Bucyrus, Ohio.
Orton & Steinbrenner, Chicago, Ill.
Osgood Co., The, Marion, Ohio.

CRUSHERS AND PULVERIZERS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.
American Pulverizer Co., St. Louis, Mo.
Austin Mfg. Co., Chicago, Ill.
Austin-Western Road Mach. Co., Chicago, Ill.
Buchanan Co., Inc., C. G., New York, N. Y.
Butterworth & Lowe, Grand Rapids, Mich.
Fuller-Lehigh Co., Fullerton, Pa.
Good Roads Machinery Co., Kennett Square, Pa.
Hardinge Co., New York City, N. Y.
Jeffrey Mfg. Co., Columbus, Ohio.
K. B. Pulverizer Co., New York, N. Y.
Kennedy-Van Saun Mfg. & Eng. Corp., New York, N. Y.
Kent Mill Co., Brooklyn, N. Y.
Lewistown Fdry. & Mach. Co., Lewistown, Pa.
McLanahan-Stone Mach. Co., Hollidaysburg, Pa.
Morgan Engineering Co., Alliance, Ohio.
Munson Mill Machinery Co., Utica, N. Y.
New Holland Machine Co., New Holland, Pa.
Pennsylvania Crusher Co., Philadelphia, Pa.
Raymond Bros. Impact Pulv. Co., Chicago, Ill.
Smith Eng. Works, Milwaukee, Wis.
Sturtevant Mill Co., Boston, Mass.
Traylor Eng. & Mfg. Co., Allentown, Pa.
Universal Crusher Co., Cedar Rapids, Iowa.
Universal Road Mach. Co., Kingston, N. Y.
Webb City and Carterville Fdy. and Mach. Co., Webb City, Mo.
Williams Pat. Crush. & Pulv. Co., Chicago, Ill.

CRUSHER REPAIRS—Manganese Steel
American Manganese Steel Co., Chicago Heights, Ill.

DERRICKS
American Hoist & Derrick Co., St. Paul, Minn.

DIPPER TEETH
American Manganese Steel Co., Chicago Heights, Ill.

DRILLS
Sanderson Cyclone Drill Co., Orrville, Ohio.

DRILLERS
Pennsylvania Drilling Co., Pittsburgh, Pa.

DRYERS
American Process Co., New York City.
Fuller-Lehigh Co., Fullerton, Pa.
Lewistown Fdy. and Mach. Co., Lewistown, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

DUST COLLECTING SYSTEMS
Allis-Chalmers Mfg. Co., Milwaukee, Wis.

DYNAMITE
Hercules Powder Co., Wilmington, Del.

ENGINES—Steam
Morris Mach. Works, Baldwinsville, N. Y.

ENGINEERS
Buckbee Co., J. C., Chicago, Ill.
Hunt, R. W., & Co., Chicago, Ill.
Richard K. Meade & Co., Baltimore, Md.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Webster Mfg. Co., Chicago, Ill.

EXCAVATORS
Brown Hoisting Machinery Co., Cleveland, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Koehring Co., Milwaukee, Wis.

EXCAVATORS—Dragline Cableway
Link-Belt Co., Chicago, Ill.
Sauerman Bros., Chicago, Ill.

EXPLOSIVES
Hercules Powder Co., Wilmington, Del.

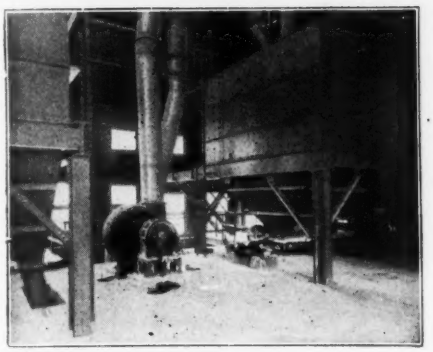
GAS PRODUCERS
Morgan Construction Co., Worcester, Mass.
R. D. Wood & Co., Philadelphia, Pa.

GEARS
Link-Belt Co., Chicago, Ill.

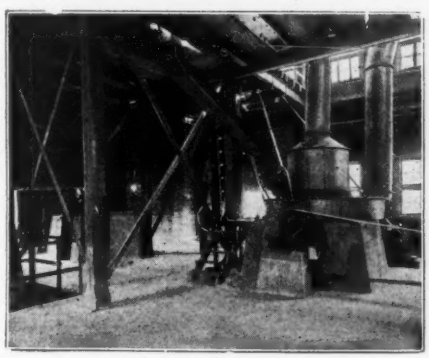
GLASS SAND EQUIPMENT
Lewistown Fdy. & Mach. Co., Lewistown, Pa.

GRINDING MILLS
Munson Mill Machinery Co., Utica, N. Y.

GRIZZLIES
Robins Conveying Belt Co., New York City.



Raymond Special Exhaust Fan Direct Connected to Motor



Raymond Roller Mill with Gypsum Dryer in Background at Left

Raymond Roller Mills for Hydrated Lime

The satisfaction of knowing that the hydrate you are producing is of constant uniform quality and will not give serious trouble months after it has been used is worth many times the money you pay for

A Raymond Air-Separating Equipment

For quality, fineness and low cost of production use **Raymond Equipment** between your hydrator and finished product bin.

Raymond Bros. Impact Pulverizer Co.

1301 North Branch Street Chicago, Ill.

Western Office: 1002 Washington Bldg., Los Angeles, Calif.
Eastern Office: 50 Church St., New York City

Buyers' Directory
of the Rock Products Industry

Classified Directory of Advertisers in this issue of Rock Products

HOISTS
American Hoist & Derrick Co., St. Paul, Minn.
Austin Mfg. Co., Chicago, Ill.
Link-Belt Co., Chicago, Ill.
Thomas Elevator Co., Chicago, Ill.
Vulcan Iron Works, Wilkes-Barre, Pa.
Weller Mfg. Co., Chicago, Ill.

HOSE
Robins Conveying Belt Co., New York City, N. Y.

HYDRATING MACHINERY
Atlas Car & Mfg. Co., Cleveland, Ohio
Kritzer Co., The, Chicago, Ill.
Miscampbell, H., Duluth, Minn.
Schaffer Eng. & Equip. Co., Pittsburgh, Pa.
Toepfer & Sons Co., W., Milwaukee, Wis.

HYDRAULIC DREDGES
Morris Machine Works, Baldwinsville, N. Y.

INGOT IRON
American Rolling Mill Co., Middletown, Ohio.

INSULATION
Celite Products Co., Chicago, Ill.

LIME HANDLING EQUIPMENT
Link-Belt Co., Chicago, Ill.
Webster Mfg. Co., Chicago, Ill.
Weller Mfg. Co., Chicago, Ill.

LIME KILNS
Steacy-Schmidt Mfg. Co., York, Pa.
Vulcan Iron Works, Wilkes-Barre, Pa.

LOADERS AND UNLOADERS
Brown Hoisting Machinery Co., Cleveland, Ohio.
Erie Steam Shovel Co., Erie, Pa.
Jeffrey Mfg. Co., Columbus, Ohio.
Link-Belt Co., Chicago, Ill.
Orton & Steinbrenner, Chicago, Ill.

LOCOMOTIVES
Baldwin Locomotive Works, The, Philadelphia, Pa.
Fate-Root-Heath Co., Plymouth, Ohio.
Hadfield-Penfield Steel Co., Bucyrus, Ohio.
Ironton Engine Co., Ironton, Ohio.
Jeffrey Mfg. Co., Columbus, Ohio.
Lima Locomotive Works, New York, N. Y.
Vulcan Iron Works, Wilkes-Barre, Pa.
Whitcomb Co., Geo. D., Rochelle, Ill.

MANGANESE STEEL REPAIRS
Hadfield-Penfield Steel Co., Bucyrus, Ohio
Moore & Moore, Inc., Reading, Pa.

MOTOR TRUCKS
Traylor Eng. & Mfg. Co., Allentown, Pa.

PAINT AND COATINGS
Williams, C. K., & Co., Eaton, Pa.

PERFORATED METALS
Cross Eng. Co., Carbondale, Pa.
Hendrick Mfg. Co., Carbondale, Pa.

PLASTER MACHINERY
Butterworth & Lowe, Grand Rapids, Mich.

PORTABLE CONVEYORS
Link-Belt Co., Chicago, Ill.

POWDER
Hercules Powder Co., Wilmington, Del.

POWER TRANSMITTING MACHINERY
Link-Belt Co., Chicago, Ill.
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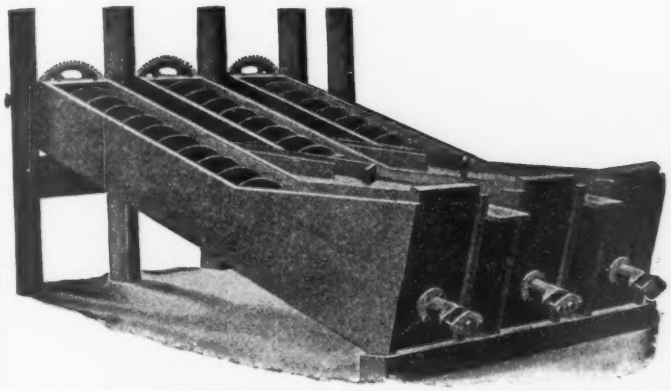

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You know that more economical gas producers in your plant will soon pay for themselves and save you money.

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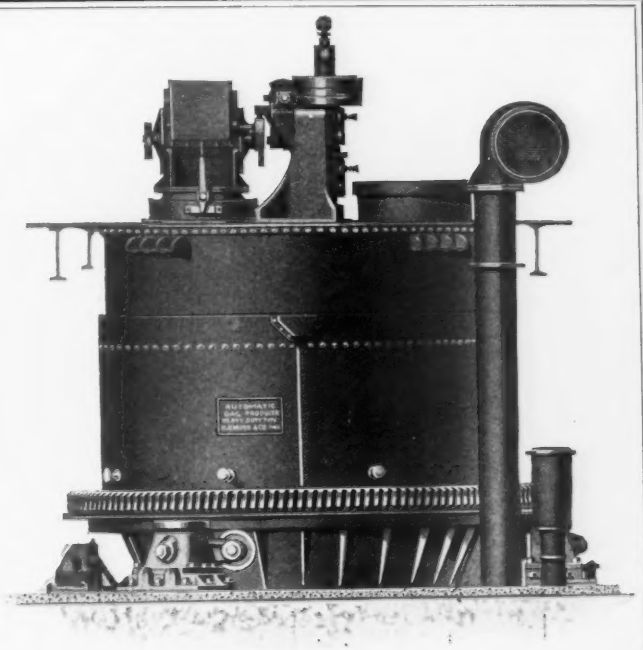

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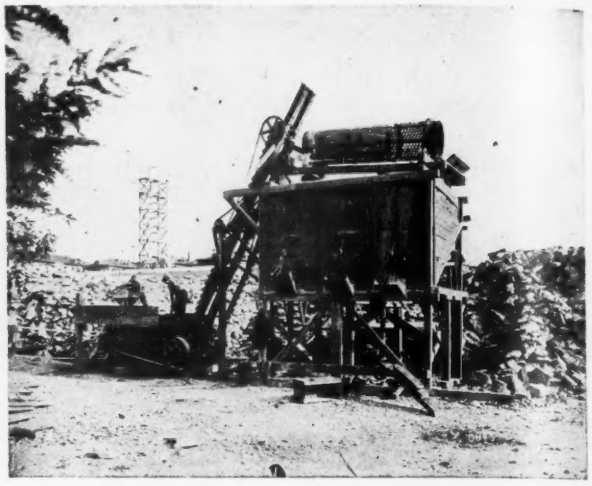
Portable outfit for loading bins from ground storage, showing Jeffrey Continuous Bucket mounted on a four-wheel traveling truck



Road building outfit showing Jeffrey Continuous Bucket Elevator, which carries stone from crusher to revolving screen

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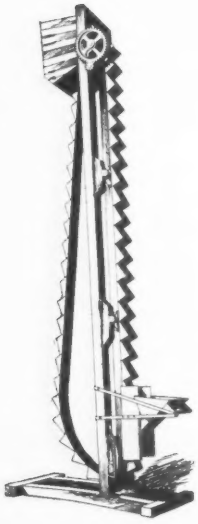
A Jeffrey Standard Bucket Elevator Can Be Quickly Shipped and Installed



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By consulting our Catalog No. 244-E, which should be in your files, all you need to do is to advise us the material to be handled, the centers, type and capacity desired, and in a short time the elevator is on its way to you, saving the Time, Labor and Expense of making layouts.

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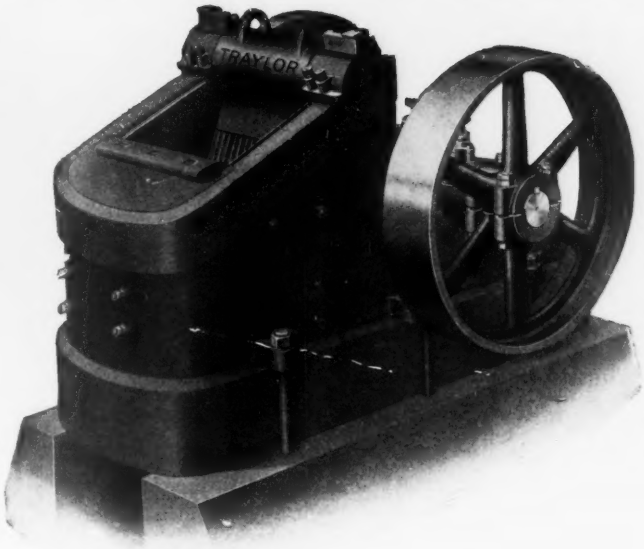

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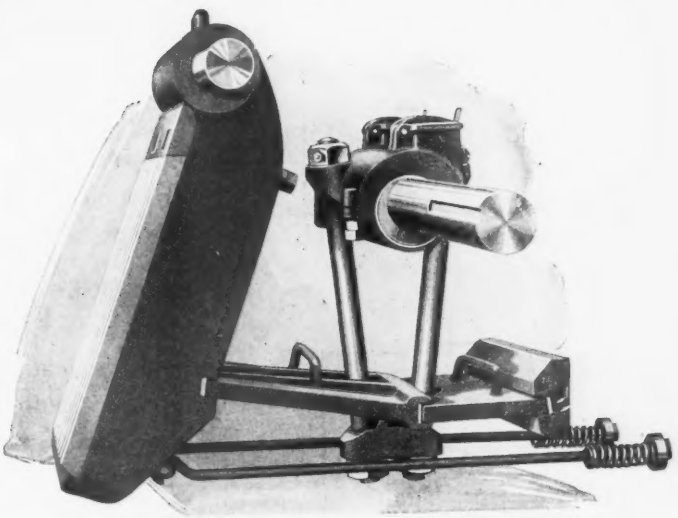

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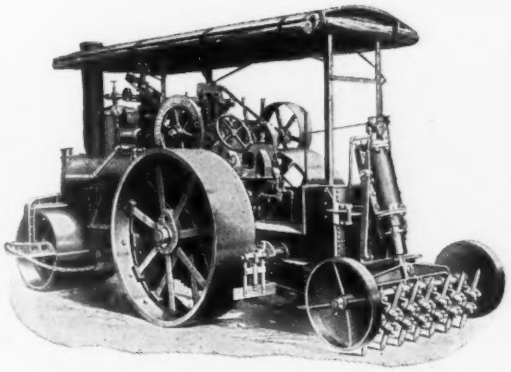

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The Last Word in Steam Rollers

The Austin has all the good features common to steam rollers, and in addition has exclusive features of proven value which represent the greatest advance in steam roller construction in years, and add greatly to the operating efficiency of the roller besides saving money for its owner.

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The only single unit transmission.
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Wider gear faces.

Austin Steam Rollers will measure up to your most exacting requirements, and then surprise you by how far they surpass them. These rollers are fully illustrated and described in Special Roller Catalog FT. Write for your copy today

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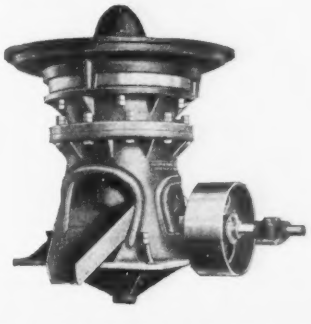
Austin equipment in your crushing plant will solve your most difficult production problems. Austin Crushers have features found in no others, while Austin Elevators, Screens, Cars and other accessories are in a class with the crushers.

Maximum output with minimum delay is the combination responsible for the remarkable operating records made by Austin equipped plants.

Crusher Catalog 29-T tells the whole story. Drop us a card and we'll send you one by return mail.



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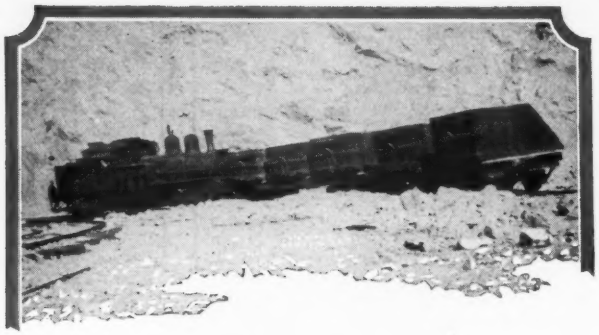

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Why not supplant those unsuited rod engines with Shay Geared Locomotives? By doing so you can save transportation money and reduce your costs.

Look into the Shay Geared Locomotive, its exceptional pulling power, ability to work on rough track and sharp curves, its economical operation, low upkeep and other features which make the Shay an efficient, money-saving locomotive for quarry and excavating service.

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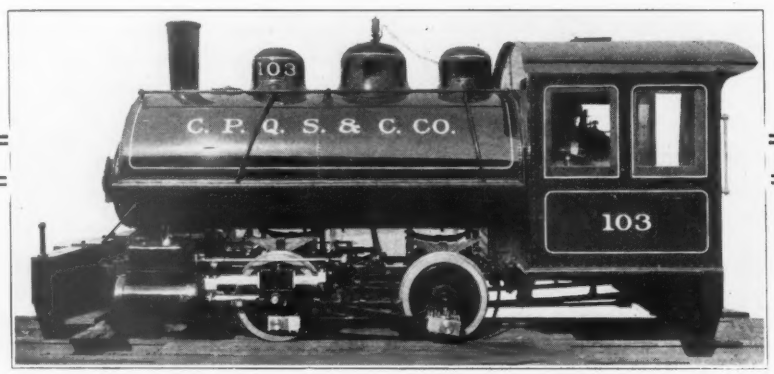

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Let us tell you some facts.

The Central Pennsylvania Quarry Stripping and Construction Company own more than 100 Vulcan Locomotives. When the efficiency experts of a large organization standardize on certain equipment, it can be accepted as a fact that the equipment in question has convincingly demonstrated its ability to perform efficiently and with the minimum in cost of operation and upkeep.

Vulcan Locomotives are powerful, rugged machines, serving the steam shovel and crusher without interruption.

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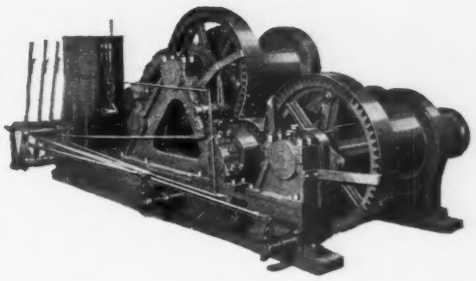

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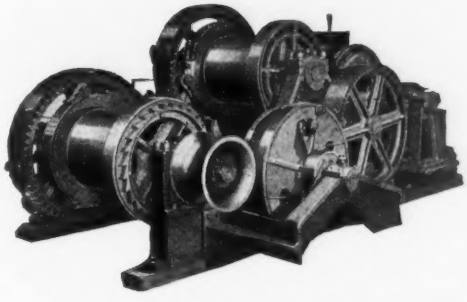

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Keep on hand adequate supplies of repair parts to avoid idleness of motive power in the busy season

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Orders for such parts receive our prompt attention. A well filled stock room, containing parts most frequently required for locomotive maintenance, is in itself the best form of locomotive insurance.

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WELLER-MADE EQUIPMENT

For Handling the Materials Mechanically

Increase the Output and Reduce Costs by Employing Weller-Made Machinery to Do the Work

It is sturdy and reliable. Never lays down on the job. The cost of operation is small. Will help pay dividends.

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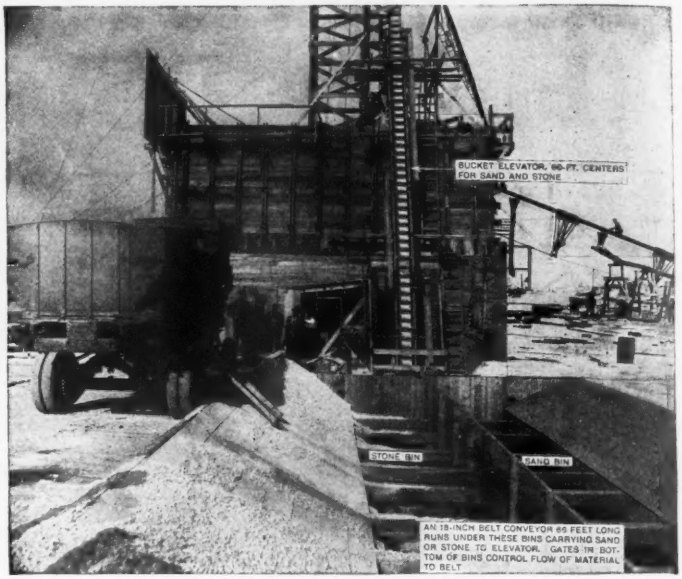

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SWINTEK'S *Traveling Suction Screen Nozzle—*

"We installed a Swintek Traveling Suction Screen Nozzle, and we are pleased to say that it will do all, if not more than claimed for it.

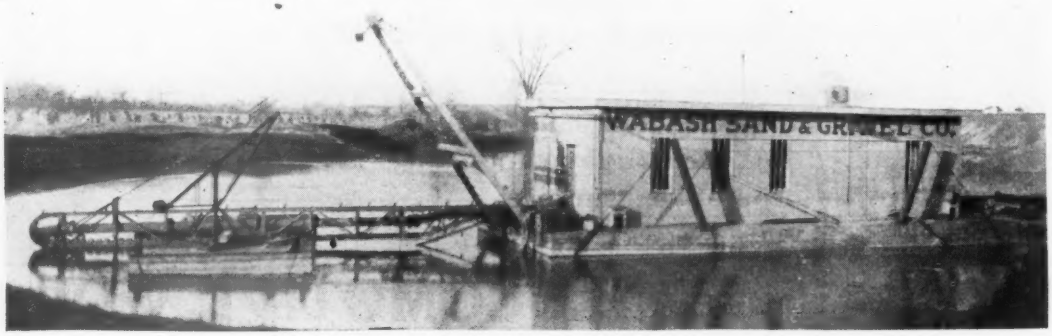
"We think more of it than any other piece of machinery we have."

Yours very truly,
Baker Gravel Company,
By E. S. BAKER.

Read Mr. Baker's expressed opinion of the Swintek Traveling Suction Screen Nozzle.

This enthusiasm grows as users learn more and more of the results obtained by the use of this Nozzle.

Men of Mr. Baker's standing in the industry do not pass out hearty recommendations unless the service performance of the equipment is unusual, then they gladly pass the good news along for the benefit of the industry as a whole.



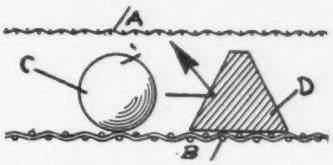
The Swintek Traveling Suction Screen Nozzle Co., Eddyville, Iowa, U. S. A.

ROTEX No. 6 SCREEN 40"x84" $342.00

Study the basic patented feature of the Rotex, as illustrated by the diagram at the right.

This explains why you can get a continuous and uniform separation regardless of material—why the gradual closing up of the sieve is prevented, and why we will gladly place this machine in your plant on a 30-day trial.

Write to us for the details concerning this 30-day trial offer, if your product must be screened through meshes between two and three hundred per lineal inch.



A—Sifting screen or fabric.
B—Coarser, ball supporting screen.
C—The balls flying about under the rotating action of the screen hit the inclined surface D and are deflected upward, hitting the sifting screen over its entire surface.

THE ORVILLE SIMPSON COMPANY

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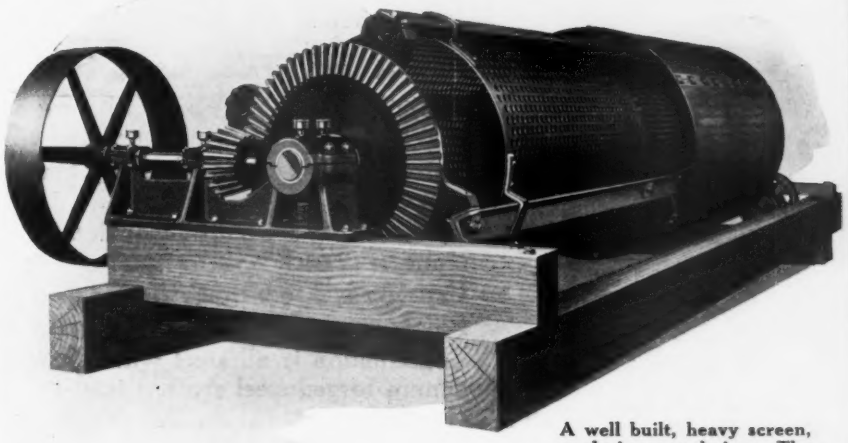
The TOEPFER SCREEN

The efficiency of the entire plant is dependent upon screens.

No matter how efficient the crushers are, the screens must be designed right and built right in order to screen an evenly sized, clean product.

This is realized by the important quarry operators throughout the country who have installed the Toepfer Screens to take care of this work. Every installation has confirmed the correctness of this choice.



A well built, heavy screen, made in several sizes. The head ring at the receiving end is cast steel running on chilled rollers. The gear head and main bearing are cast in one piece.

We also manufacture: Elevators, Sand Washers, Washing Screens, Grizzlys, Feeders, Conveyors, Bin Gates, Perforated Metals.
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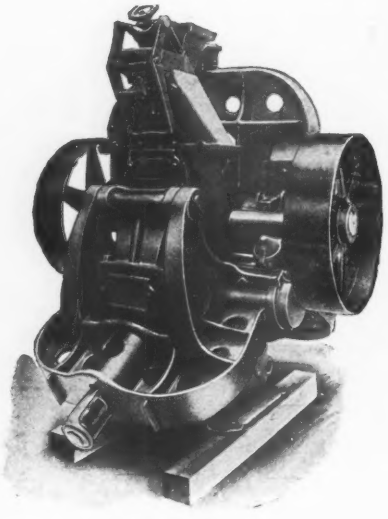

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For Fine Pulverizing of

Limestone, Gypsum, Phosphate, etc.

EFFICIENT—ECONOMICAL—RELIABLE

PERFECTECON SCREEN SEPARATOR

For Large Capacity Screening

Let These Solve Your Cost and Trouble Problems

KENT MILL COMPANY

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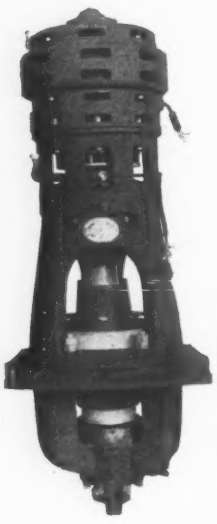
The New Weston Direct Drive Gyratory Crusher for Secondary Reduction of Hard Rock, Ore and Gravel



A BETTER CRUSHER BECAUSE

Gears, Countershafts and Belts are eliminated. Eccentric is at the top, is Bronze Bushed and oil floated.

Entrance of dust into oil supply and bearings is absolutely prevented.

By removing six bolts—machine can be taken apart with crane or derrick.

Capacity is 3 to 5 times greater than geared gyratories.

Power consumption is exceptionally low.

Construction is all steel with Chrome-Vanadium Molybdenum forged steel shaft.

Built in six standard sizes—largest size takes 12-inch rock rejecting 350-450 tons per hour. Smallest machine when set to 1¾ inches rejects 120 tons per hour, or 40 tons per hour with ½-inch setting.

Send for Bulletin 25 Which Describes This Machine in Detail

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Designers, Manufacturers and Contractors
Electric Traveling Cranes, Rolling Mill Machinery
Ordance, Steel, Shipbuilding and Forging Plants Complete
Rock Crushers, Special Machinery for Any Purpose

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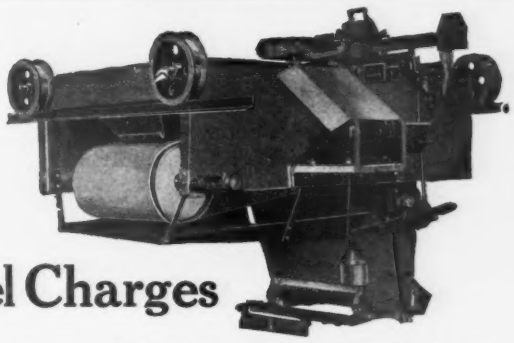
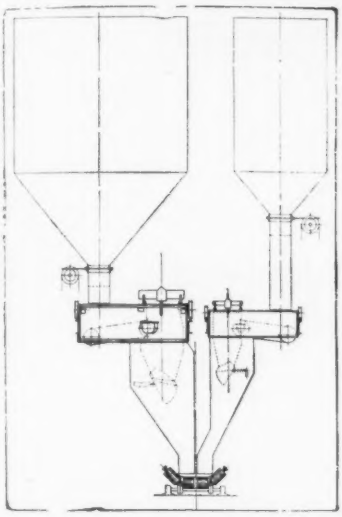
Use RICHARDSON

Automatic Bulk Scales To Check Output of Lime Against Fuel Charges





Improved efficiency and better profits in the lime plant demand the elimination of wasteful extravagance in burning coal.

Richardson Automatic Scales furnish a continuous and reliable check on coal fed to boilers and kilns and register automatically exact output of finished lime.

Production checked against fuel charges will give you the control you need.

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THE FIRST ERA STILL LEADS IN QUALITY

THE HADFIELD-PENFIELD STEEL COMPANY
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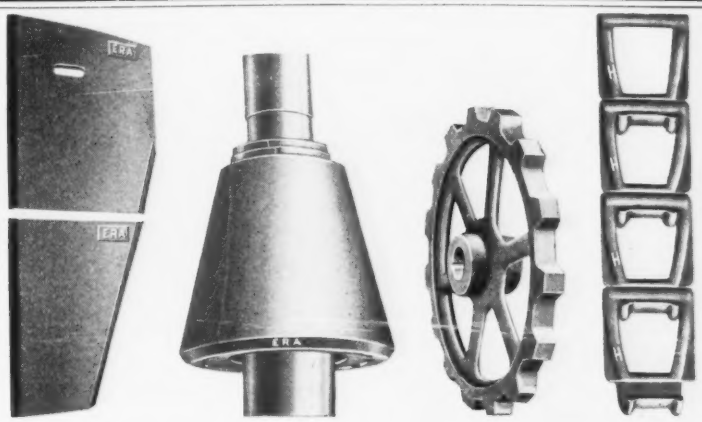

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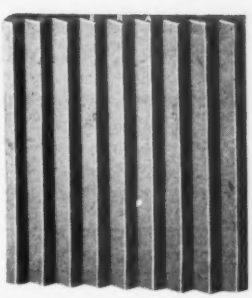
"ERA" Manganese Steel Repair Parts wherever there is excessive wear. They last longer, therefore they are more economical for

Gyratory Crusher Parts—Heads, Concaves and Renewable Mantles, Gears and Pinions and Wearing Plates.

Jaw Crushers—Jaw Plates, Cheek Plates, Toggles and Toggle Bearings.
Standard detachable chains of all sizes and Sprocket Wheels.



The Hadfield-Penfield Steel Company, Bucyrus, Ohio

"A WILLING WORKER"

It is sometimes difficult to get the first olive out of the bottle, but after you get the first one the rest comes easy.

It's the same in selling Type "J" Locomotive Cranes. Sell one Type "J" and repeat orders follow.

WHY?

Because it is a regular "honest to goodness" crane, big by comparison, both in size and service.

It is human nature to like a willing worker, one that does a full day's work, day after day, without interruption or without coaxing.

Try out the type "J" and its operation will speak more convincingly than anything that can be said of its merits.

The McMyler Interstate Company
Cleveland, Ohio LC-108

BRANCH OFFICES:

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Chicago, Illinois	Railway Exchange Building
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Birmingham, Alabama	Brown-Marx Building
Boston, Massachusetts	261 Franklin Street

Free Service to Readers of

Rock Products

If you are in the market for any kind of machinery, equipment or supplies, or if you desire catalogs, information or prices on any product, we are at your service—to obtain for you, without expense, catalogs, prices or specific information on every kind of machinery, equipment and supplies—or to help you find the hard to find source of supply.

RESEARCH SERVICE DEPARTMENT

ROCK PRODUCTS, 542 So. Dearborn St., Chicago, Illinois

Please send me catalogs and prices concerning the following items:

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AMSCO

Pumps that Wear Longer Cost Less—

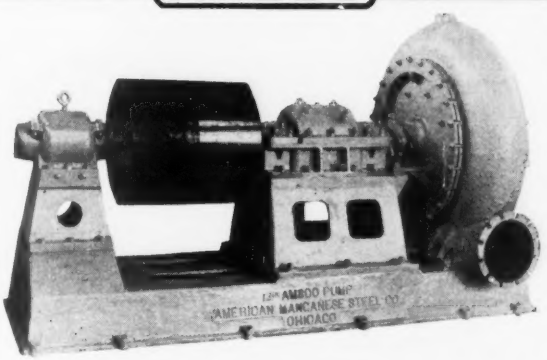
The effectiveness of Amsco Pumps is based on the season's output rather than any one day's record.

It is steady production, day after day, without delays and breakdowns, that determines the size of your profits, the productive ability and economy of your pump.

Let some of the men whose profits depend upon the efficiency of their Amsco Pumps tell you how these pumps are performing.

We will be glad to send you names of Amsco owners. Write today for our Pump Catalogue.

AMSCO



American Manganese Steel Co.
General Sales Office:
398 East 14th St., Chicago Heights, Ill.
FOUNDRIES:
Chicago Heights, Ill.; New Castle, Del., and Oakland, Calif.

Complete Equipment Plus Engineering Service

PLANTS equipped under the Allis-Chalmers plan of "Undivided Responsibility" include the complete apparatus necessary for their successful operation.

With the apparatus designed by its own engineering staff and built in its own shops, the Allis-Chalmers organization is able to include the complete equipment in a single contract, thus saving a purchaser the burden of handling the many details, disputes, delays and oftentimes expensive complications arising where a number of separate contracts are involved.

Allis-Chalmers engineering service is of the utmost value to a user in the selection of equipment suited to his particular conditions and in its economical operation for maximum plant efficiency.

Of particular interest to Rock Products readers is the following Allis-Chalmers Equipment.

- Crushing Machinery
- Complete Crushing Plants
- Cement Machinery
- Complete Cement Plants
- Dust Collecting Systems
- Powdered Coal Plants
- Air Compressor Equipment
- Centrifugal Pumps and Pumping Units
- Electric Motor Drive and Control Equipment
- Power Units with any Type of Prime Mover
- Complete Electrical Equipment "from Prime Mover to Switchboard"
- Power Transmission Machinery

ALLIS-CHALMERS
Manufacturing Company
Milwaukee, Wis., U. S. A.
District Offices in All Leading Cities.

MOBILITY

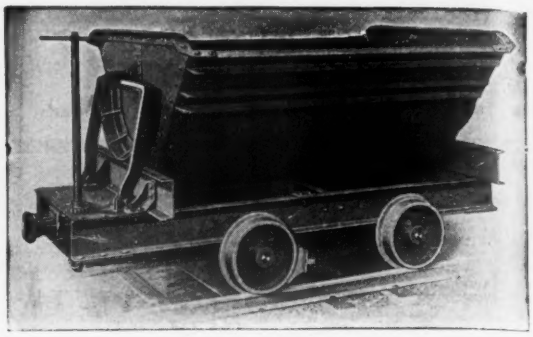
Its one-motor construction is ideal for quarry service—

THE demands made upon a shovel are greatest, possibly, in the quarry; hour after hour a quarry shovel battles with stone, rocks and dirt. The Northwest Gas or Electric Shovel stands the shocks of the quarry. It has only one motor. Full power at the dipper lip is obtained through an ingenious rig of cables. There are no gears, racks, pinions, auxiliary engines or other easily worn out complications.

How the Northwest stays on the job and how it cuts maintenance costs is an interesting story. Write the Northwest Engineering Co., Chicago, for specifications.

NORTHWEST SHOVEL

CRANE DRAGLINE SHOVEL



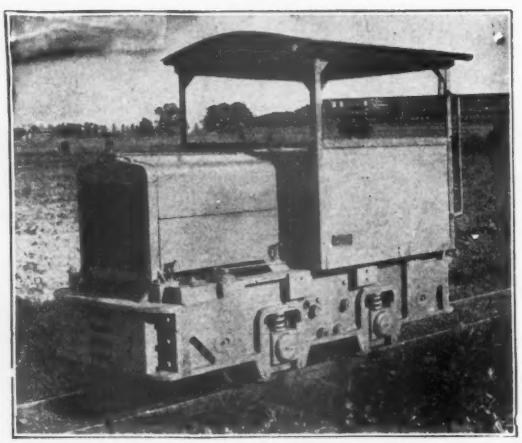
More Than Reinforced

Reinforcing a dump car makes it stronger, of course. But there is a best way to reinforce. Atlas cars are reinforced the best way. Why? Simply because we have built dump cars so long and for so many people that we know just where the reinforcing should go and just how it should be done.

Not much wonder, then, that Atlas dump cars stand the "gaff" better than the average.

The Atlas Car & Manufacturing Co.
ENGINEERS MANUFACTURERS
CLEVELAND, OHIO, U. S. A.

WHITCOMB LOCOMOTIVES



QUARRIES—CEMENT PLANTS—BRICK PLANTS

The success of Whitcomb locomotives in hundreds of plants speaks of their thoroughness of design and construction and dependability in time of need. We would be glad to tell you what they are doing for others.

Whitcomb locomotives are designed to work and built to overwork

WRITE TODAY FOR BULLETINS

GEO. D. WHITCOMB COMPANY
Rochelle, Ill., U. S. A.

MERIT and Value are built into our O. S. Dependable Crane.

The steady and dependable construction has been demonstrated in hundreds of cases through the efficient and economical service the machine gives.

It is an exceptionally mobile crane with an unusual radius of operation, and made for a variety of uses.

Its value makes it a "good buy." Write for catalog.

Orton & Steinbrenner Company
Chicago
Factory:
Huntington, Indiana

A GOOD BUY

Big Jobs, Big Men, and
Big Machines Go Hand in Hand

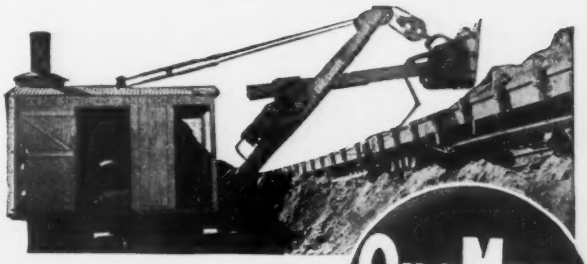
Osgood Steam Shovels

—big in Power, big in Quality and big in Efficiency —always find a place.

Revolving or Railroad types in a wide range of capacities —each with the same speed, snap and steady productivity that characterizes Osgood Machines.

Let us tell you more about them. Ask for our latest Bulletins and Catalog.

THE OSGOOD COMPANY, Marion, Ohio



One Man; 350 Tons

When you require an output of 800 to 1,000 tons of sand or gravel per day, a fireman is needed in addition to the steam shovel operator. But when you are getting out 350 tons a day, or less, one man can often both operate and fire an ERIE Shovel. The Cumberland Sand Co., of Cumberland, Md., write us:

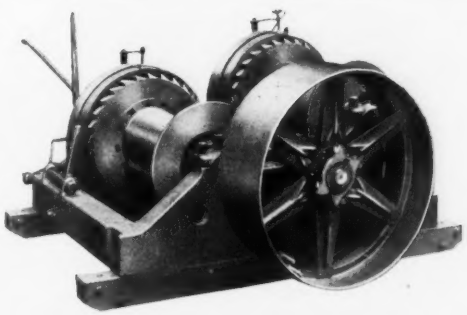
"Our labor cost is only a trifle; one man operates and fires our ERIE *and keeps it in repair. The saving of labor means more efficiency, and our output has increased considerably. To any prospective purchaser, we recommend the* ERIE."—**A. K. Smith, Manager.**

Every ERIE Shovel easily and quickly changed over to Locomotive Crane to handle clamshell bucket.

The ERIE is very strongly built; gives steady service in hard work. Its output compares VERY FAVORABLY with that of much larger and more costly shovels. We will be glad to send you a bulletin showing just what the ERIE Shovel can do. Write for Bulletin P-16.

Erie Steam Shovel Co., Erie, Pa., U. S. A.
Builders of ERIE Steam Shovels and Locomotive Cranes

ERIE Revolving Shovels Steel Mod.



This No. 2 "AMERICAN" Belt Hoist with extra large pulley develops a 6,000-pound single line pull without double purchase gearing. If you have an old traction engine or gasoline engine, or power available on a line shaft, you can use it to run this belt hoist, which you can buy for a great deal less than a complete steam or electric hoist will cost. This "AMERICAN" Belt Hoist has fewer wearing parts than most machines of this type; less wear, less noise.

AMERICAN HOIST & DERRICK CO.
Saint Paul, Minn.
New York - Chicago - Pittsburgh - Seattle - New Orleans - Detroit

Unloaded 18 Cars in 3 Days

AME-49

"Our 12-ton INDUSTRIAL CRANE recently unloaded 17 cars of coal and one car of pig iron in three days, including changing from bucket to magnet and back again," writes Mr. H. O. Hart, Superintendent of the Grand Rapids Malleable Works. "Before we installed the Crane it took one man from 1½ to 2 9-hour days to unload one car."

This "Industrial" is saving this firm more than $13,000 per year. It also does other work, such as grading where the dirt was so full of slag that handling with shovels was almost impossible. To quote Mr. Hart again: "The Crane kept nine wagons busy making three trips an hour to a point four blocks away, and easily completed the job within the time desired."

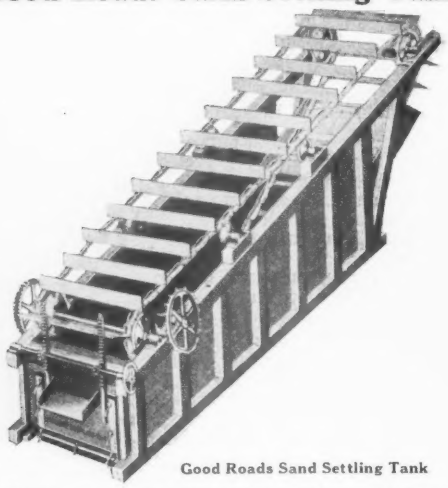
Write for illustrated Catalog No. 109

INDUSTRIAL WORKS
BAY CITY, MICHIGAN

The Sand That's In Demand

is clean sand—the kind that's washed—the kind that's produced with a

Good Roads Sand Settling Tank



Good Roads Sand Settling Tank

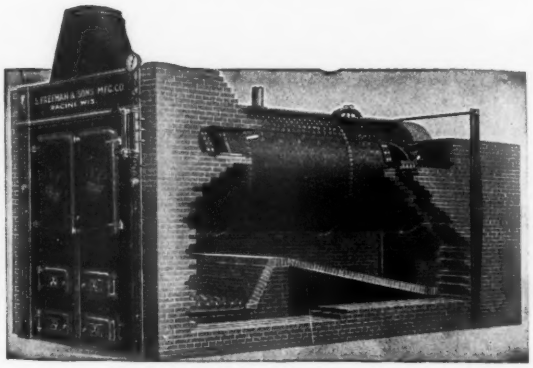
Our business is to design and build complete sand and gravel washing and screening plants—the kind that give satisfaction and profit to the user.

If you expect to change or enlarge your present plant, or equip a new plant, we would like to confer with you. Our advice will cost you nothing.

Ask for catalogue No. 5A. It is an informing book for sand and gravel producers

THE GOOD ROADS MACHINERY CO., INC.
1203 Tower Building, Chicago, Ill. Kennett Square, Pa.

FREEMAN
Horizontal Return Tube High Pressure Boiler



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Freeman Manufacturing Co.

Main Office and Works, Racine, Wisconsin, U. S. A.

METRO NITE

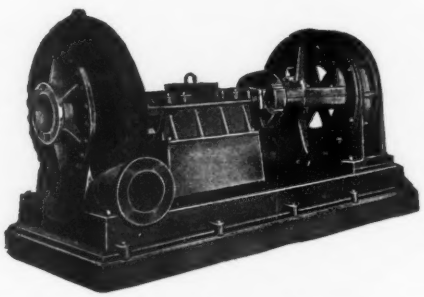
for Stucco

Metro-Nite White is a siliceous dolomite, extremely hard, sharp, cleanly graded and makes a bright, sparkling face for stucco buildings, concrete bricks or blocks.

It is generally accepted as the most beautiful and artistic facing known for this purpose, and we will gladly send samples to anyone who is interested in carload lots.

Metro-Nite can be delivered either in white or green.

THE METRO-NITE CO.
333 Hartford Ave., Milwaukee, Wis.



Heavy Service Dredging Pump

Where conditions are too severe for our standard sand pump, the above type is recommended.

It is built in sizes from 4 in. up, arranged for belt, motor, or engine drive.

MORRIS MACHINE WORKS
50 Genesee St. Baldwinsville, N. Y.

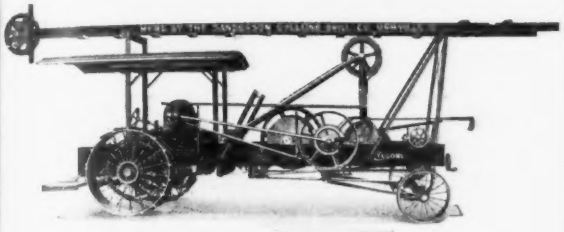
39 Cortlandt St., New York City
Forrest Bldg., Philadelphia, Pa.
217 N. Jefferson St., Chicago, Ill.
Penobscot Bldg., Detroit, Mich.

Bulletin No. 19-B fully describes our complete line of sand and dredging pumps. Have you your copy?

M O R R I S

Since the Civil War Builders of Centrifugal Pumps, Hydraulic Dredges, and Steam Engines

The Cyclone No. 14 Junior



A Drill for Plants of Limited Production

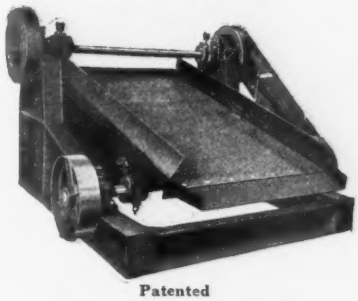
FOR a number of years there was a demand for a small and light blast hole drill of the well driller type capable of handling drilling tools of medium weight used for drilling holes from 4 to 5 inches in diameter. Many lime plants, some cement rock and sandstone quarries, pits producing shale for brick manufacture and quarries having shale overburden that requires blasting, have need for such a drill.

To meet this demand, the Cyclone No. 14 Junior drill was placed on the market two years ago. In design it is a counterpart, only built on a smaller scale, of the No. 14 Standard (now called Standard to distinguish it from the Junior), which is now over thirteen years old, having grown up with the big hole method of drilling and blasting. The same care and workmanship are maintained in the Junior. It has cast steel working parts. It is lighter and speedier and may be had at a lower first cost than the No. 14 Standard which, for plants as described in the preceding paragraph, is a little heavy and has a surplus capacity.

The No. 14 Junior and the No. 14 Standard make a complete line of big blast hole drills. They are fully described in our Catalog B-45. Write for a copy.

THE SANDERSON-CYCLONE DRILL CO.
ORRVILLE, OHIO
Eastern and Export Office: 30 Church Street, New York City

Robins Grasshopper Screen



Patented

A Vibrationless Shaking Screen for Sand and Gravel

Simply and ruggedly constructed. Occupies small space.

Efficient screening at 75 to 100 tons an hour, passing 70 per cent through.

Write for Information

Robins Conveying Belt Company
New York, Chicago, Birmingham, Boston, Denver, El Paso, Los Angeles, Philadelphia, Pittsburgh, Salt Lake City, St. Louis

YORK LIME KILNS

OUR working arrangements with the foremost lime and hydrating engineer in the country, together with the practical experience and technical qualifications, enables us to make a special investigation of lime deposits, and then treat them properly in order to secure the best results.

The York Kiln makes possible a high thermal efficiency with a low fuel consumption, cutting the "per ton" cost of calcination to the minimim.

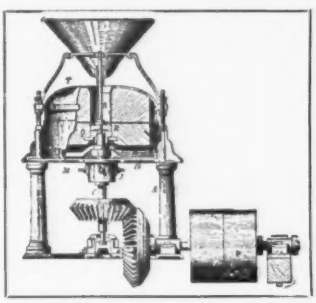
We also manufacture:

Dryers
Hydrators
Gas Producers
Rotary Screens
Tanks
Grey Iron Castings
Special Machinery from Engineers' Designs

McGann Manufacturing Company, Inc.
Works, York, Pa.
332 S. Michigan Ave., Chicago 50 Church St., New York

Do You Do Fine Grinding?

THE Munson Underrunner Buhr Mill has stood the test of time and is still first choice with a large number of concerns whose product demands fine, uniform grinding.

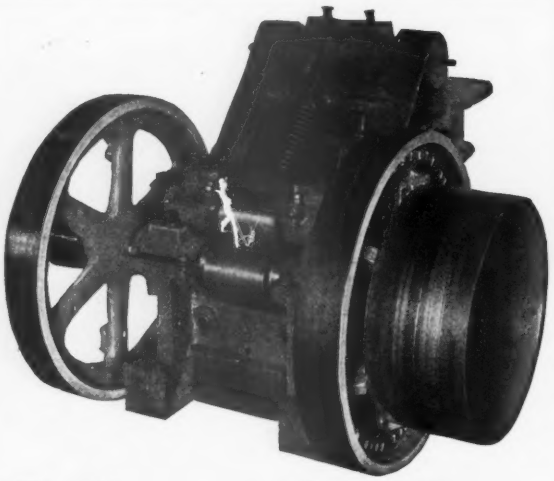


This mill is particularly well adapted for grinding limestone, gypsum, hematite ores, slate and similar materials, though in actual service it is used on a much wider variety of products.

Send us a sample of the material you wish ground so that we may tell you the possibilities of the "MUNSON."

Catalog No. 71 tells more about these mills.

Munson Mill Machinery Co., Inc.
Est. 1825 **Utica, N. Y.**



Reliance Crushers

IN ALL SIZES FOR EITHER PORTABLE PLANTS FOR ROAD BUILDING OR STATIONARY QUARRY INSTALLATIONS.

BUILT FOR LONG, HARD SERVICE—WILL SAVE YOU MONEY IN THE LONG RUN

Let us quote you prices

Universal Road Machinery Co., Kingston, N. Y.

Branches in all principal cities in U. S. and Canada

MANUFACTURERS OF THE FAMOUS RELIANCE LINE OF ROAD BUILDING AND QUARRY EQUIPMENT

Positive Evidence of Satisfaction—

"When we require additional machines for our purposes they will be purchased from the American Pulverizer Company of this city. All our transactions with the company have been handled in a business-like and satisfactory manner."

Yours truly,
Gordon Willis, President,
Hunkins-Willis Lime & Cement Company.

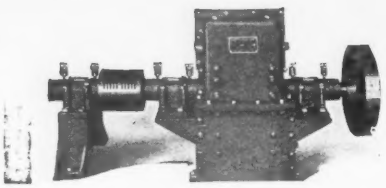
The worth of any machine is best expressed by those who use it, and have used it over a period of time sufficiently long to determine all its qualities; but when a user says: "When we require additional machines for our purpose, they will be purchased from the American Pulverizer Company," that is definite and positive evidence of user's satisfaction and the greatest tribute he can pay.

There are many satisfied users.

American Pulverizer Company

General Office and Factory:
18th and Austin Streets St. Louis, Mo.

"K-B" ALL-STEEL PULVERIZER



High Production Low Power Cost

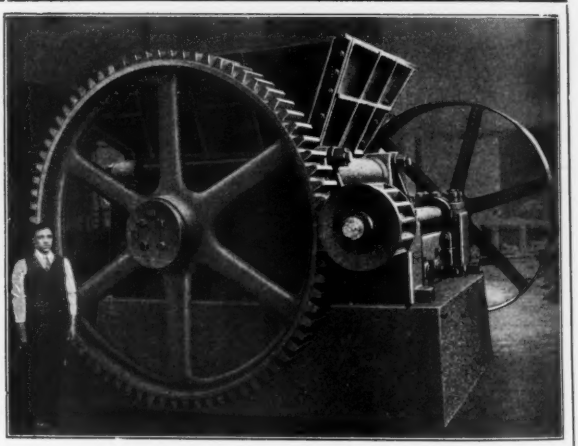
The efficiency of any machine lies in its ability to do a large amount of work with a small consumption of power.

The "K-B" does this!

Ask us for full information

K-B PULVERIZER

K-B Pulverizer Company, Inc.
92 Lafayette Street, New York



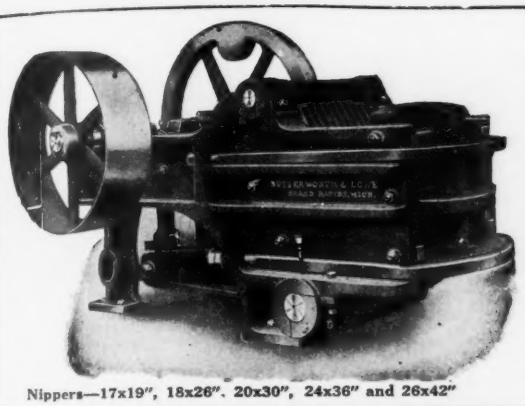
If you had seen the McLanahan Single Roll Crusher before ordering your first Gyratory or Jaw Crusher, you would now be running only the McLanahan Crushers.

After many years' practical experience building and operating other crushers, we brought out the first Single Roll Crusher, proved it best, simplest and most economical—making least fines—requires but little head room—no apron or hand feeding—takes wet or slimy material.

Capacity, 5 to 500 Tons Per Hour

McLanahan-Stone Machine Co.
Hollidaysburg, Pa.

Screens, Elevators, Conveyors, Rock Washers, Etc.



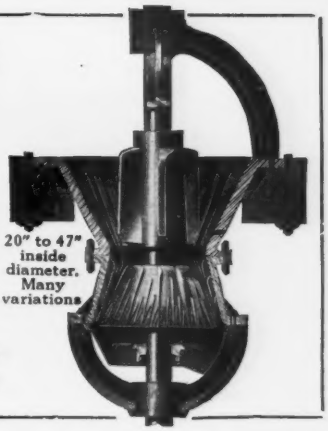
Nippers—17x19", 18x26". 20x30", 24x36" and 26x42"

JAW & ROTARY CRUSHERS

For All Rocks and Ores Softer Than Granite

GYPSUM MACHINERY—We design modern Plaster Mills and make all necessary Machinery, including Kettles, Nippers, Crackers, Buhrs, Screens, Elevators, Shafting, etc.

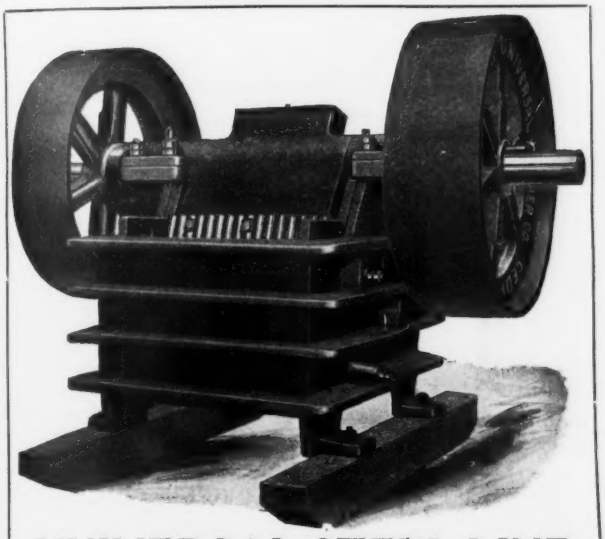
Special Crusher-Grinders for Lime



20" to 47" inside diameter. Many variations

Butterworth & Lowe

17 Huron St. Grand Rapids, Mich.



UNIVERSAL STEEL LINE

THE PERFECT GRAVEL AND REJECTION CRUSHER

Sizes up to 8"x36". Capacities 20 to 200 tons daily. Crushes to ¾" and finer if desired. Has no superior for FINE CRUSHING and UNIFORMITY of product.

STRONG LIGHT DURABLE ECONOMICAL

UNIVERSAL CRUSHER CO.

225 Third Street Cedar Rapids, Iowa, U. S. A.

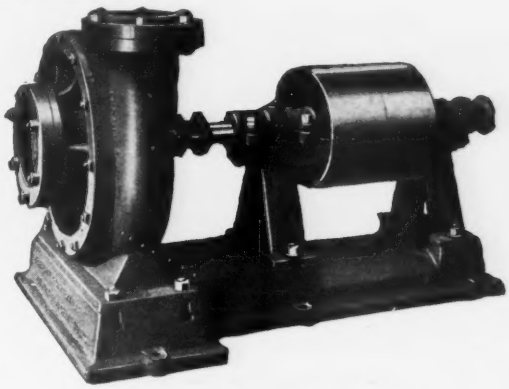
Webb City & Carterville Foundry & Machine Works

Webb City, Missouri

Engineers Founders Machinists

Complete Crushing Plants Designed

Manufacturers of rock crushing machinery: Jaw Crushers, Hercules-Giant and Heavy Duty Crushing Rolls, Screens, Centrifugal Pumps, Elevators, Stone Buckets, Sheet Metal Work, Stone Cars.



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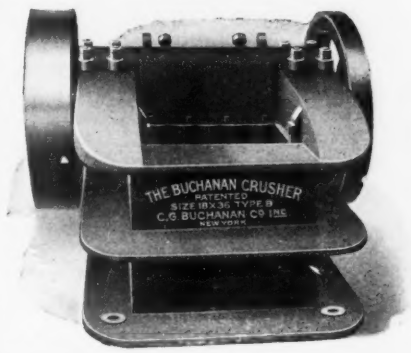


BUCHANAN ALL-STEEL CRUSHER

Type "B" Jaw Crusher

Frame is a solid casting of open-hearth steel in one piece having a tensile strength of 60,000 to 65,000 lb. per square inch, three or four times stronger than cast iron and with at least three or four times the rigidity of the built-up rolled steel-plate crusher.

Jaw and Cheek Plates are of the best Manganese Steel, made reversible for double wear—Adjustable Jaw Stroke—Shim Adjustment—Safety Toggle—Reversible Steel Toggle Seats—Phosphor Bronze Frame Bearings (in smaller sizes)—Steel Swing Jaw and Pitman—Pitman water jacketed and parting in larger sizes.

Built in sizes up to 18" x 36".

Large Crushers, Crushing Rolls, Complete Crushing Plants

Write for Bulletin No. 9

C. G. BUCHANAN COMPANY, Inc.

Cedar and West Streets, New York City

J. C. BUCKBEE COMPANY
Engineers *and* Contractors
CHICAGO, ILL.

Design and build cement plants, rock crushing plants, power plants and industrial structures.

Examinations, Reports and Valuations of Industrial Properties

Drive Your Crane to Work!

The Byers "Truckrane" can be driven to work just like any automobile. Saves time and expense on every job. One owner recently refused $50.00 rental per day for a two weeks job in Chicago. Ask for "Truckrane" Bulletin.

THE BYERS MACHINE COMPANY
310 Sycamore Street, Ravenna, Ohio
Builders of Full Circle Cranes, "Auto-Cranes," Buckets, Hoists, etc.

Robert W. Hunt Jno. J. Cone D. W. McNaugher

ROBERT W. HUNT & CO.
Inspection—Tests—Consultation

Inspection New and Second Hand Machinery, Pumps, Crushers, Steam Shovels, Cars, Locomotives, Rails and Quarry and Contractors' Equipment

INSPECTION AND TESTS OF SAND, GRAVEL, CEMENT, STRUCTURAL STEEL, CASTINGS AND CONSTRUCTION MATERIALS

Cement, Chemical and Physical Testing Laboratories

CHICAGO
2200 Insurance Exchange
New York St. Louis Kansas City Cincinnati Pittsburgh San Francisco

Engineering Service—

This organization designs and builds Lime and Hydrated Lime, Cement and Plaster plants after making a scientific study of each proposition.

Richard K. Meade & Company
11 E. Fayette St. Baltimore, Md.

New Holland Revolving Screens

made in three different sizes and four different lengths — capacity from one to two hundred tons per hour.

Write for catalog and prices on revolving screens, jolt screens, elevators, conveyors, and primary or secondary rock crushers.

NEW HOLLAND MACHINE COMPANY
New Holland, Pa., U. S. A.

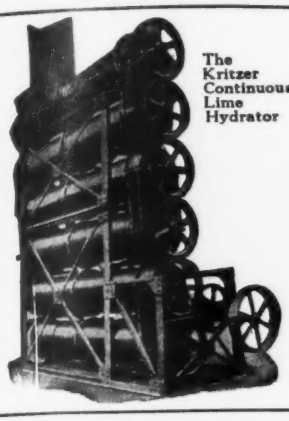
Quality and Service Always—

We manufacture screens in any desired wire material, in any style, or size of mesh. Uniform Double Crimped sand and gravel screens. Heavy screens for crushed stone. A large stock of galvanized wire cloth and fine mesh in either steel, copper or brass always on hand. "Everwearing" spring steel screens are practically indestructible.

Send for circular—prices always right

TWIN CITY IRON AND WIRE COMPANY
St. Paul, Minn.

When writing advertisers please mention ROCK PRODUCTS



The Kritzer Continuous Lime Hydrator

HYDRATE

Years ago we helped our customers create a demand for their hydrate. Today the demand exceeds the supply. That's why every lime manufacturer should have an efficient, economical hydrating plant.

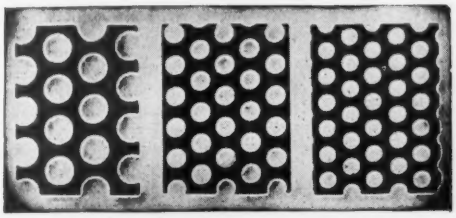
THE KRITZER Continuous Lime Hydrator is efficient in production and economical in operation and maintenance. Let us investigate exhaustively the local conditions peculiar to your proposition, and then apply our experience of many years and design a plant to meet those conditions.

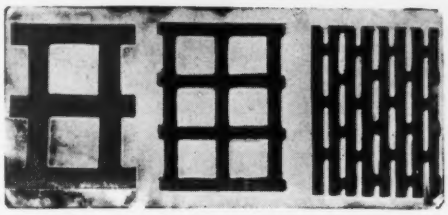
A KRITZER plant, scientifically adapted to your conditions, will give you the best product at lowest cost

THE KRITZER COMPANY

503 South Jefferson Street CHICAGO, ILL.

Perforated Steel Screens





For Screening Stone, Gravel, Sand and Cement

All sizes and shapes of holes in metal of proper thicknesses to give the best screening results.

Sheets furnished flat or rolled to shape for revolving screens.

THE HARRINGTON & KING PERFORATING CO.

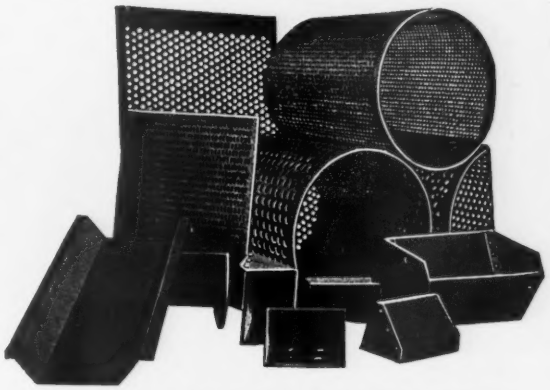
621 N. Union Ave., Chicago, Ill.

NEW YORK OFFICE: 114 Liberty St.

Perforated Metal Screens

FOR

Stone, Gravel, Sand, Etc.



ELEVATOR BUCKETS

PLAIN AND PERFORATED

General Sheet and Light Structural Work

"Light and Heavy Steel Plate Construction"

HENDRICK MFG. CO.

CARBONDALE, PA.

New York Office, 30 Church Street
Pittsburgh Office, 544 Union Arcade Bldg.
Hazleton, Pennsylvania, Office, 705 Markle Bank Bldg.

CROSS ENGINEERING CO. CARBONDALE, PA. PERFORATED SHEET METALS

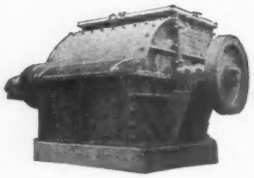
Perforated Steel Screens

The success of any house supplying repair and renewal parts depends on furnishing what is needed quickly and correctly, and of satisfactory quality.

Sixteen years in the Perforated Metal field have given us the experience, equipment and technical knowledge and three hundred tons or more of Steel Plates and Sheets enable us to fill rush orders promptly.

Try us with your next order.

Cross Engineering Company, Offices and Works, Carbondale, Pa.



Gruendler Hercules Crushers

Gruendler Hercules Crushers are reducing production costs in hundreds of plants throughout the country.

"America's Famous Crushers"

For Crushing and Pulverizing Limestone, Lime, Gypsum, Shale, etc., a Gruendler cannot be beat.

Write for Interesting Bulletin

Gruendler Patent Crusher & Pulverizer Company
908 North Main Street St. Louis, Mo.

The Morgan Producer Gas Machine

is the highest class gas producer built in the U. S. and is advertised in this journal the second issue of each month.

Morgan Construction Company
Worcester, Mass.

W. D. Mount, 601 Peoples National Bank Bldg., Lynchburg, Va., Representative in the Lime Industry

Atlanta Baltimore Boston Chicago, Charlotte, N. C.
Montreal Minneapolis Kansas City New York St. Louis Pittsburgh

MORSE DRIVES

Morse Chain Drives

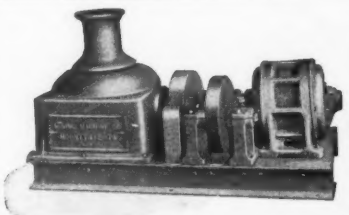
A POWER SAVER FOR POWER USERS

Morse Chain Co., Ithaca, N. Y.

HIGH SPEED SILENT RUNNING FLEXIBLE GEARING FOR POWER TRANSMISSION

Address Nearest Office

Cleveland Detroit San Francisco Philadelphia



The "HANDY MAN" Car Puller

This car puller equipment will give you absolute control in the spotting or replacing of cars, loaded or unloaded, and without regard for weather conditions. It will pull cars from either direction, is exceptionally compact and rugged in construction, can be installed in a limited space, and motor is protected by metal cover.

Furnished in type and size to meet your special needs—Motor or Belt drive. The "Handy Man" is a real money saver.

MINING MACHINE CO., MOUNTVILLE, PA.

REPEAT orders indicate satisfied customers. That's why we are proud of the fact that a large percentage of our sales are to people who are already operating Sauerman Cableways. One large sand and gravel compny has seven of our machines installed at their different plants. If you wish to know why our equipment is so popular, send for Pamphlet No. 17.

SAUERMAN BROS.
430 South Clinton Street Chicago

SAUERMAN DRAGLINE CABLEWAY EXCAVATORS
dig, convey, elevate and dump in one operation

EMERSON STEAM PUMPS

For more than 20 years Emerson Pulsating Pumps have been standing the gaff of rough and ready service for contractors, in mines, quarries and cofferdams or in any place where service is severe.

Emerson Foot Valves Fit Any Pump
Write for Full Information

The Emerson Pump and Valve Co., Inc.
Alexandria, Va.

ANCHOR BRAND COLORS

For Mortar, Cement and Brick—
Brown, Black, Red and Buff
—Strongest and Most Durable

Manufactured by

C. K. Williams & Co.
Correspondence Solicited EASTON, PA., U. S. A.

HUM-MER *Electric* SCREEN

Makes screening and crushing more profitable. Screens any material, wet or dry, from 2½" opening to minus 200 mesh.

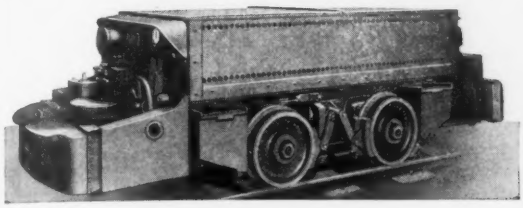
Send for Catalogue 45-R

THE W. S. TYLER COMPANY
CLEVELAND, OHIO
Manufacturers of Woven Wire Screens and Screening Equipment

THE IRONTON
STORAGE BATTERY LOCOMOTIVE

Efficient, economical hauling. Find out about storage battery locomotives for your hauling. The Ironton is the best storage battery locomotive.

The Ironton Engine Co.
Ironton, Ohio



Carroll
SOLID WELD
Steam Shovel
Chains

Uninterrupted Chain Service!

There, Is Your Economy and Increased Production

"Carroll" Solid Weld Chains wear out, but they do not break or pull out at the welds

THE CARROLL CHAIN COMPANY
COLUMBUS OHIO

OHIO LOCOMOTIVE CRANES
OHIO LOCOMOTIVE CRANE CO.
BUCYRUS, OHIO

Chicago Office: Railway Exchange Bldg. New York: 30 Church St.

FULLER PRODUCTS
Insure Fullest Satisfaction

Crushing Rolls.
Pulverizer Mills.
Direct and Indirect Fired Dryers.
Ball and Tube Mill Liners and Partition Plates.
Fuller-Kinyon System for Conveying Pulverized Materials.
Sprockets, Traction Wheels, and Roll Heads.
All kinds of High Grade Chilled Charcoal Iron Castings for All Uses.

Ask for catalogue and prices

FULLER-LEHIGH COMPANY
Fullerton, Pa., U. S. A.

We Look Into the Earth

By using Diamond Core Drills. We drill for Limestone, Gypsum, Talc, Fire Clay, Coal and all minerals.

We are fully equipped for testing foundations for bridges, dams, buildings, and all work of a similar character.

PENNSYLVANIA DRILLING CO.
Drilling Contractors
Pittsburgh, Pa.

NOAH

Had to use an Ark to Keep from Getting His Feet Wet

You can use an

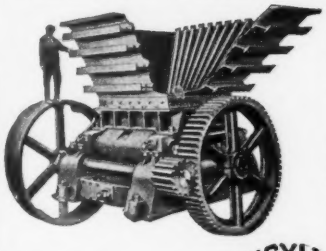
Automatic Aerial Tramway

And keep out of the mud and water next spring.

Costs nothing to investigate. Write us.

Interstate Equipment Corporation
25 Church Street
New York City

"PENNSYLVANIA" Single Roll Crusher



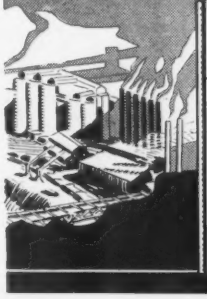
The New Series of "Pennsylvania" Single Roll Crushers take steam-shovel feed of limestone, cement rock, gypsum and similar materials, — wet and sticky, — without feeder, and make maximum reduction in one operation. All parts readily accessible. Maintenance cost lower per ton than for any other type. Massive construction — Reliable Safety Devices — Convenient adjustment. Capacities 5 to 450 tons hourly.

Put Your Reduction Problems Up to Us

PENNSYLVANIA CRUSHER COMPANY
Stephen Girard Bldg., Philadelphia

New York
Pittsburgh

SIL-O-CEL
PREVENTS HEAT PENETRATION



Heat Insulation
for Cement Kilns and Waste Heat Boilers

Sil-O-Cel Insulation possesses a lower heat conductivity than any other known material and will withstand extremely high temperatures. Furnished in convenient forms for easy application.

Detailed information and blueprints sent upon request. Write for Bulletin S-95.

CELITE PRODUCTS COMPANY
New York-11 Broadway Chicago-53 W. Jackson Blvd. San Francisco-Monadnock Bldg.
CELITE PRODUCTS LIMITED, New Birks Bldg., Montreal, Canada
OFFICES AND WAREHOUSES IN PRINCIPAL CITIES

Used Equipment

Rates for advertising in the Used Equipment Department: $2.50 per column inch per insertion. Minimum charge, $2.50. Type ads only. No cuts or illustrations permitted unless at the regular display advertising rates. Please send check with order. These ads must be paid for in advance of insertion

IMMEDIATE SHIPMENT

2—Austin No. 3 Gyratory Crushers.
2—Bonnot 5'x22' Compeb (tube) Mills.
1—Vulcan 8'x100' Rotary Kiln.
1—Vulcan 7'x120' Rotary Kiln.
1—Renneberg 5½'x45' Ore Dryer.
4—American Process 4'x30' Rotary Dryers.
2—Hardinge 8' Conical Mills.
1—Link Belt 20-Ton Hourly Coal Crusher.
Raymond, Kent and Fuller Mills.
Swing Hammer Mills, all makes.
Buchanan and Sturtevant Crushing Rolls.
Jaw, Gyratory and Disc Crushers.
Complete Experimental Cement Plant.

High Grade Used Machinery for the Entire Rock Products and Non-Metallic Industry Our Specialty

American Machinery Equipment Co., P. O. Box No. 292, Charlotte, N. C.

FOR SALE

2—8x110' Rotary Kilns.
5—5x6x7x110' Rotary Kilns.
5—5x21' Tube Mills (1 has Silax lining, 3 steel lining, 1 without lining).
1—4' 6"x29' Coal Dryer.
2—No. 6 Gates Crushers.
3—5½x22' Tube Mills.
2—6x50' Rotary Dryers.
3—Kominuters.
6—Krupp Ball Mills.
3—33" Fuller Mills.
2—6x60' Rotary Dryers.

ENGINEERING SALES COMPANY, Nashville, Tenn.
OLLIE LAWRENCE, Stockertown, Pa.

FOR SALE

1—Steam Fire Pump—Underwriters' specifications, 18x10x12-in. Capacity 1000 gallons per minute on four 1⅛-in. smooth nozzles at 70 r.p.m. Type 216420-B. No. 537049-W. Price, $500.

1—120 K. W. generator, A. C. current, 440 volt, 3 phase, 60 cycle, 157.5 amperes per terminal, 900 r.p.m. Serial No. 607964 Westinghouse. Price, $2,000.

2—Sirocco fans made by American Blower Company. No. 80-B and 8379-B. Price, $200 each.

1—Pangborn Sand Blast Machine. Standard pressure system. Type A. C., size No. 6. Serial No. 131837. Price, $300.

1—7x100 Vulcan kiln complete with tires, trunnions, cradles, hood, etc. Price, $5,000.

4—Tires for 8-in. kiln. Price, $100 each.
1—W7 Penna. Hammer Mill. Price, $750.
1—Buchanan Roll, 24x15. Price, $350.
1—No. 3 Sturtevant Fan. Price, $25.
1—No. 5 Sturtevant Fan. Price, $250.

Security Cement and Lime Co.
Hagerstown, Maryland

DREDGE FOR SALE

Fully equipped steam suction dredge ready for immediate service.

8-in. Morris direct connected pump.

Dull inclined conical screens.

Separate sand sluice so that straight sand can be pumped without elevating to sand and gravel separating rig.

Hull built of full length Oregon fir.

H. H. Halliday Sand Co.
Cairo, Ill.

For Sale by Owners

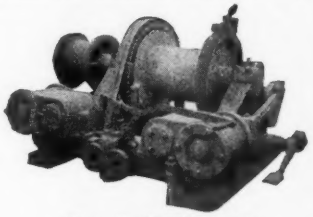
Quarry equipment, consisting of standard gauge locomotives, steam shovel, quarry cars, crushers, well drills, rails, ties, etc.

Box 1625, care of Rock Products
542 South Dearborn Street, Chicago

FOR SALE

BARGAIN

Emerson, Bratingham Hoists
UNUSED
DOUBLE CYLINDER, SINGLE DRUM, IN FIRST CONDITION
$125.00 Each F.O.B. Chicago



Capacity 10,000 Pounds
IMMEDIATE SHIPMENT
Detailed Specifications Furnished on Application
"QUANTITY IS LIMITED"

Hyman-Michaels Co.
531 Peoples Gas Bldg., Chicago, Ill.

FOR SALE

One set of 16"x32" Balanced Sturtevant Rolls; used only two days. Address

Box 1627, care of Rock Products,
542 South Dearborn Street, Chicago, Ill.

WANTED

Shaft, or Shaft and Head for 7½ Gates Crusher, B or D style.

MASSACHUSETTS BROKEN STONE COMPANY
Stony Brook Massachusetts

Mine Cars, Rails and Ties

We have mine cars in stock for all purposes. Also rails 12 lb. to 100 lb. section. Spikes, bolts, frogs and switches. All trade is solicited and prices cheerfully quoted.

M. K. FRANK
Frick Building Pittsburgh, Pa.

WANTED

7½ Gyratory Crusher, standard drive. State full particulars, including shop numbers.

DOLESE BROS. CO.
337 West Madison Street Chicago, Illinois

Used Equipment

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FOR SALE

1—John O'Laughlin No. 1 Gravel or Stone Screen, complete and in good condition. 4 Jackets.

1—Dean Bros. double-acting duplex Steam Pump, 7x6; used only few months.

1—Fairbanks-Morse 5x4 centrifugal Water Pump; good condition.

Priced to sell f. o. b. Riverton, Ind. I. C. R. R.

Merom Gravel Company
208 Indiana Trust Bldg., Indianapolis, Ind.

FOR SALE

1—Chicago Pneumatic Type N-SO2 Fuel Oil Driven Air Compressor
2—Ingersoll-Rand Type D-24 Rock Drills
Both in first-class condition. Subject to prior sale.

Wire or Write
Crystal Carbonate Lime Company
Louisiana, Missouri

FOR SALE

No. 3 Austin Gyratory Crusher complete.
2 No. 2 Climax 9″x16″ Jaw Crushers complete.
1800 ft. No. 4 d.b. and w.p. electric wire.
50′ Cont. bucket and chain elevator, buckets 8″x16″.
75 H.P. 13″x16″ side crank Erie City Steam Engine.
9″x14″ Vulcan Locomotive No. 981 complete.
2 G.E. 150 H.P. Induction Motors, voltage 220-440, shop numbers 625140 and 1164925—complete with starters.
Williams No. 9 Universal type swing hammer pulverizer complete.
Kent three-roller pulverizer.
10″x8″x20″ Worthington St'm Pump No. 16876.
Sanderson Cyclone No. 14 well drill, either electric or gasoline driven, complete.
Austin Standard Revolving Screen 40″ diam. by 20′ long, complete.

E. W. COOPER, Engineer
174 3rd Ave. North Nashville, Tenn.

Special Bargains

Send Us Your Boiler Inquiries

66x86-in. Traylor Jaw Crusher
No. 18K Gates' Crusher
25-50-80-110 H. P. Elec. Hoists
Nos. 4-5-6-7½-9 and 10 Crushers
6 and 12-ton Gasoline Locomotives
2-Disc Crushers, 36 in. Symons
100-ton, 2½-yd. Electric Shovel
50-5000 ft. Steam Belt and Electric Compressors
13-30 in.; 10x18 in.; 9x14 in. Jaw Crushers
24x54 McLanahan Roll Crusher
50 H.P. D. D. Hoist, 440-v., 3 ph. Motor Dragline Set
New G. E. Gas Engine Sets, 5-25KW.
New 1000 g. p. m. Pump, 440-v., 3 ph. Motor
1000 g. p. m. Underwriters Steam Pump

Send Us Your Inquiries for Your Wants

Ross Power Equipment Co.
Indianapolis, Ind.

Take advantage of the Opportunity offered in the Used Equipment Department to dispose of the equipment that you no longer need.

Machinery For Sale

DRYERS—Direct-heat rotary dryers, 3x25′, 3½x25′, 4x30′, 5½x50′, 6x60′ and 7x60′; double shell dryers, 4x20′, 5x30′ and 6x35′; steam-heated air rotary dryers, 4x30′ and 6x30′.

KILNS—Rotary kilns, 4x40′, 5x50′ and 6x70′, 6x100′, 7x80′ and 8x110′.

MILLS—6x8′, 6x5′, 5x4′, 3x3½′ pebble and ball mills; 3′ March mill; 42″, 33″ and 24″ Fuller-Lehigh mills; 4½x20′, 5x11′, 5x20′, 5½x22′ and 6x20′ tube mills; 7½x13″, 9x15″, 16x10″ and 12x26″ jaw crushers; one "Infant" No. 00, No. 0, No. 2, No. 3, and No. 9 Williams' swing hammer mills; one Kent type "G" mill; 24″, 36″ and 40″ cage mills; 3′ and 4½′, 6′ and 8′ Hardinge mills; 18x12″, 20x12″ and 30x10″ roll crushers; No. 0, No. 1 and No. 3 Sturtevant rotary crushers; one No. 2 Sturtevant ring roll crusher; 5 roll and 2 roll No. 1 and No. 000, No. 00 and No. 0 Raymond mills; one No. 3 and No. 4 and No. 7½ Telsmith breaker; one 36″ Sturtevant emery mill; one 3 roll Griffin mill; 60″ chaser mill.

SPECIALS—Five automatic package weighing machines; jigs; 6x8′, 6x5′ and 4x3′ Newaygo vibrating screens; Richardson automatic scales; 8′ and 10′ Emerick air separators.

Air compressors.

W. P. Heineken, Engineer
95 Liberty Street, New York. Tel. Cortland 1841

ROTARY DRYERS

30 New Direct Fired Rotary Dryers, 4 ft. — in. diameter, 30 ft. long

These Dryers were about to be put into operation as the armistice was signed, and consequently were never used. We are offering them at a sacrifice, complete with driving mechanism, furnace iron, grates, etc. Some are equipped with steam radiators for steam heated air drying.

McDERMOTT BROS. CO.
Allentown, Penna.

WANTED

Air separator 18′, prefer Gayco. Advise present condition, location, price, etc. Also one belt or chain elevator, 75 to 80 ft. centers, with about not less than 7 x 14 buckets complete. Address

Box 1631, Care of Rock Products
542 So. Dearborn St.
Chicago, Ill.

Crushers For Sale

1—No. 10 McCulley
1—No. 8 McCulley
1—No. 8 Allis-Chalmers

We are making a low price to move these machines immediately.

Consumers Company
2555 South Park Avenue Chicago

2—50-ton standard-gauge Baldwin 6-wheel switchers, built 1913.

1—42-ton standard-gauge Shay geared locomotive.

1—12x18 in. standard-gauge 4-wheel saddle tank.

10—5-ton 36 in. gauge storage battery locomotives.

1—14-B Bucyrus steam shovel, mounted on traction wheels.

30—Miles 56-lb. relay steel rails; Hawkinsville, Ga.

30—Miles 50-lb. and 56-lb. relay steel rails; Percy and Webb, Miss.

Birmingham Rail & Locomotive Co.
Birmingham, Alabama

For Sale at a Bargain

Six Used Kent Mills
Five Used Maxecon Mills

For quick disposal. Will sacrifice Kent Mills for $350 each and Maxecon Mills at $500 each. Two of the Maxecon Mills bought new in 1917 and one bought new in 1920. All mills can be inspected at La Salle, Ill.

Marquette Cement Manufacturing Company
La Salle, Ill.

FOR RENT AND SALE

1—Class 14 Bucyrus dragline on caterpillars, 70-ft. boom, 2-yd. bucket, built in 1921.
1—Osgood 18 revolving shovel, traction wheels, No. 794, ¾-yd. bucket, built 1920.
1—Western std. gauge spreader, used 60 days.
50—60,000-lb. capacity flat and box cars.
2—Foote 40-S 1-yd. side discharge concrete mixers, with steam engine and boiler.
14—NEW 20-in. I-beams, 80 lbs. per, 40 ft. long, not drilled.
1—NEW Lakewood concrete chuting system.

LOCOMOTIVES

3—20-ton 11x16″ four-driver saddle-tank standard gauge Americans, built 1912.
1—50-ton 18x24-in. six-wheel switcher.
1—40-ton 17x24-in. four-wheel switcher.
2—NEW 24-ton six-wheel Porters, separate tender, 36-in. gauge.
2—18, 14 and 10-ton Vulcans, 36-in. gauge.

Industrial Equipment Co.
McCormick Building, Chicago, Ill.

FOR SALE

One No. 5, No. 8 Kennedy Crushers, 12x20 Buchanan. Four sections 60-in. diameter screen, 4 segments to the section, 3½-in. perforation, extra heavy manganese. Address

BALD MOUNTAIN QUARRIES, Inc.
Newsom, N. C.

WANTED

Raymond No. 5 High Side Roller Pulverizer with or without Air Separating System if in good condition. Address

Palmer Lime and Cement Company
103 Park Avenue, New York

IMMEDIATE DELIVERY

1—7 ½x13-in. Champion Jaw Crusher; excellent condition ---------- $300.00
7—1 ¼ yd. end dump wood quarry cars, 30-in. gauge ---------- 85.00
Trucks alone worth this money.
1—12x16-in. Chandler Taylor Steam Engine, side crank left hand, self contained, slide valve; 17x72-in. band flywheel, shop No. 6070; excellent condition ---------- 350.00

CERULEAN STONE COMPANY
Cerulean, Trigg County, Ky.

For Sale—STEAM SHOVEL

⅝ YD. THEW "O" TRACTION

Thoroughly rebuilt; attractive terms for quick sale.

Walter A. Zelnicker Supply Co., St. Louis
Rails, Locomotives, Cars, Tanks, Pipe

Classified Advertising

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Position Wanted

Quarry Engineer, Associate Member, American Society of Civil Engineers. Age 36; single; three years' experience railroad and building construction. Past 12 years quarrying and open pit mining. Qualified by experience and business training for executive in charge of operations of large cement or steel companies, quarries or open pit mining properties. Familiar with well drilling, steam shovel operations, and use of high explosives. A believer in organization and cost accounting. Qualified to make investigations, build up an organization and get results. Familiar with lime kilns and hydrating plants. At present employed but desirous of change. Location immaterial. References furnished, but personal interview preferred. Address

Box 1628, care of Rock Products
542 South Dearborn Street, Chicago, Ill.

Crusher Man

Wishes to communicate with anyone east of Rockies having crushing plant with good quarry that would lease operation, owners to handle sales preferred; 500 to 1000-ton operation. Address

Box 1629, care of Rock Products
542 South Dearborn Street, Chicago, Ill.

General Crushing and Quarry Man

will be open for position in 30 days. Where complete charge of operation is required system must not prevent changes in methods. If you require man to go strictly to your dictation don't reply; any one will do. I co-operate. Address

Box 1630, care of Rock Products
542 South Dearborn Street Chicago, Illinois

For Lease or Sale

A developed marble quarry with established reputation for output. Also an exceptionally fine grained black lime, suited to be sawed into shapes.

B. R. RUSSELL, San Saba, Texas

H. E. WIEDEMANN

(Est. 1905)

Consulting and Analytical Chemist

Specialist in Analysis of Rock Products
Chemical Bldg. St. Louis

George Borrowman, Ph.D.

CHEMIST

Analyses, consultations, researches in connection with rock products, cements, clays, lime, plasters, zeolites, sands, etc.

9 So. Clinton St. Chicago, Ill.

WANTED

Master Mechanic for Crushed Stone Plant, experienced with jaw and gyratory crushers, derricks and steam engines, to take charge of machinery. Output 500 tons per day. House supplied free, school about a mile away. Advise experience and wages expected in first letter. Only high class experienced men need apply. Permanent position for capable man.

Neverson Granite Quarry
Sims, N. C.

Wanted—Superintendent

for dry screening sand and gravel plant. One who understands construction. State experience and salary desired. Address

Box 1626, Rock Products
542 South Dearborn Street Chicago, Illinois

WANTED

Man to take charge of eight large lime kilns. Must be experienced and capable of keeping records and handling men. Good wages. State experience and full details in first letter.

PEERLESS WHITE LIME COMPANY
904 Century Building St. Louis, Mo.

WANTED

Experienced operator for Sauerman Cableway Thomas Electric Hoist. Must be capable of keeping machinery in tip-top shape. Have steady position for a good steady operator. State age, experience, and salary expected in first letter, and must be ready to come by March first. References.

J. E. IRVINE, Green River, Wyo.

WANTED

Partner to go in with me in the sand and gravel plant. Have engine, pump and boat and an unlimited supply of the finest sand and gravel in Texas and plenty of market. Will require $15,000 to put the material on the cars.

R. O. Pearson, Colorado, Texas

Who should, where should, who will, when will and where will the next cement factory be built in the United States of America, and whoever has in mind such an enterprise should write

Box 328, Care of Rock Products
542 South Dearborn Street, Chicago, Ill.

Will Sell My Two Phosphate Plants

One plant in operation. Cost of plants $125,000. Equipped for mining hard and soft phosphate; 50 to 75 tons per day each; 125 miles from Jacksonville, located in the high grade hard rock phosphate belt. Analysis 76 to 82 B. P. L. I. and A. 2 to 3. Estimated over 300,000 tons of hard rock. One-half million tons of soft rock. Analysis, phosphoric acid, 24 to 32. Five hundred acres of land together with dwelling houses, phosphate bins and all other necessary buildings for laborers. One-quarter mile R. R. side track to each plant from A. C. L. R. R., main line. Will take fifty cents on the dollar for its actual value. $50,000 cash will secure the property, balance of payments, reasonable terms, or royalty basis. For further information, if interested, write me, the owner,

J. Frank Meredith
Dunnellon, Fla.

For Sale or Lease

A small, modern equipped crushing and pulverizing plant, quarry consisting of about 50 acres underlaid with a high quality Clinton strata blue limestone, 30 x 500 ft. open face dry quarry; 94.20 carbonate state test; makes an extra strong burned lime; big local demand. Plant in operation; a fine location for a larger plant. Plant near Lynchburg, Ohio. Call on or address

FRANK SHARP
Lynchburg, Ohio

For Sale or Lease

Large silica sand plant at Dundee, Ohio, with 500x40 ft. open quarry face. An inexhaustible supply of high grade silica rock testing better than 98 per cent. Address

OTIS D. CLAY
912 15th Street, N. W. Canton, Ohio

FOR LEASE OR RENT

Limestone quarry and sand; 4 lime kilns; situated 15 miles from Baltimore. For full particulars address

MRS. AUGUSTA S. BROOKE
104 Eager St. W. Baltimore, Md.

FOR SALE—CEMENT LAND

A body of land situated on the Tombigbee River, and Southern Railway, four miles from Demopolis, Ala., containing great quantity fine cement rock. An ideal location for Cement Plant. Good transportation facilities and cheap rates.

C. J. WISE, York, Alabama

INDEX TO ADVERTISEMENTS

IDEAS—

You could use an idea now and then, couldn't you?
You'll find plenty of new ones, short cuts and time savers in ROCK PRODUCTS.

Our traveling editors are running around, dropping in here and there finding out just how things are done, and then they tell you how the other fellow makes things hum.

Practical stuff—tested ideas—something *you* can use
Better fill out the blank and mail it to us today

ROCK PRODUCTS Date.....1922
542 So. Dearborn St., Chicago, Ill.

Please enter my subscription to ROCK PRODUCTS for.....year.... (one year $2.00, two years $3.00—please state which. You save a dollar by subscribing for two years), for which we enclose $..... Canadian and Foreign Subscriptions $3.00 a year.

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THREE QUARTERS OF A MILE

OF THIS KIND OF "GOING" DOESN'T STOP THE TIME SCHEDULE OF

ERIE SPEED SHOVELS

Equipped with

Williamsport Patented Telfax Marked Wire Rope

—according to the statement of Ed. Carson, the shovel operator.

The Erie Co. uses WILLIAMSPORT patented Telfax Tape marked Wire Ropes as standard equipment, even though they can supply other ropes at a big saving in first cost to them. They base the value of wire rope per mile of service, not the price per foot.

The fact that Erie uses only high grade accessories such as Williamsport Ropes, is a mighty good indication of the dependability of the rest of their equipment. It is evidence that maxium service has first consideration with the maker of Erie Shovels.

Many other shovel and crane manufacturers prefer Williamsport Ropes on their equipment for the same reason. When you buy a shovel or crane, specify Williamsport Ropes. They will give you best service at the same cost to YOU as ropes not so good.

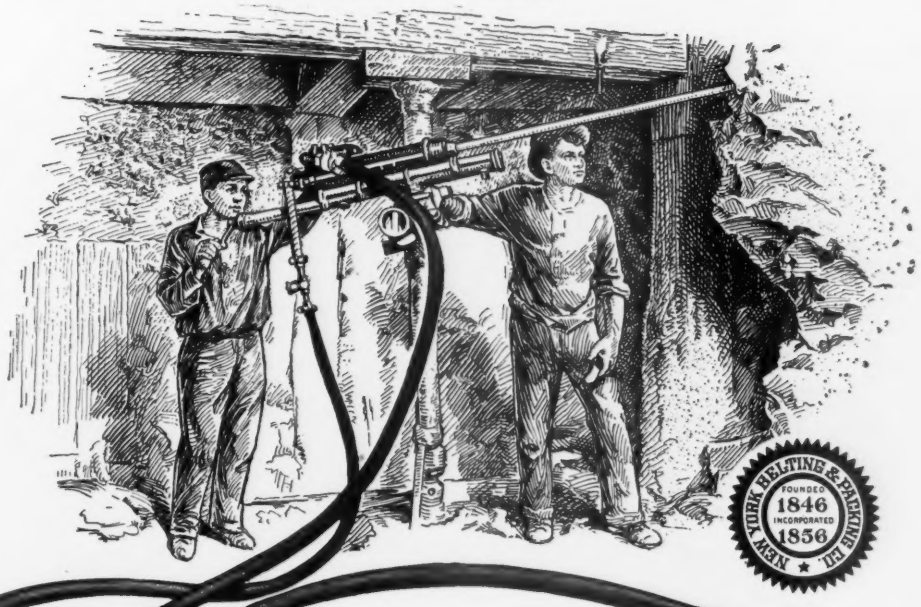
Williamsport build the only wire rope containing the Telfax Tape system of grade marking. This system enables anyone to instantly distinguish each grade of rope; — A vital safeguard for the user and an assurance of quality. We would not likely use this system if we were not sure of our quality.

WILLIAMSPORT WIRE ROPE COMPANY

Main Office and Works
Williamsport, Pa.

"accepted as the best"

General Sales Office: Peoples Gas Bldg.
Chicago, Illinois



Getting More Work From Your Drills

ONLY when your drills are backed by a steady flow of air at full pressure is it possible to obtain maximum production.

Because of certain definite qualities built into Indestructible Air Drill Hose, its use on your drills will assure uninterrupted driving power.

The great strength of the hose is but one of several features. It is guarded against expansion and kinking by a specially woven fabric jacket over which the rubber cover is applied. This also makes for flexibility which is appreciated when working in close quarters. Short bends will not kink it—you cannot blow it out with many times the average working pressure.

Your drills will remain continuously on the job—with production correspondingly increased—because the air keeps coming.

NEW YORK BELTING & PACKING CO.

Rubber Goods for the Rock Products Industry

New York Boston Chicago Philadelphia
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INDESTRUCTIBLE AIR DRILL HOSE

The Only Journal With a Paid Circulation in the Rock Products Industry

Rock Products

Entered as second-class matter, July 2, 1907, at the Chicago, Illinois, Postoffice, under the Act of March 3, 1879.

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Volume 26 March 10, 1923 Number 5

CONTENTS

The test of tests—

IT takes the best of good shovels to stand up under the hard grind of quarry service; and the Northwest is meeting this test of tests as it was never met before.

The exceptional performance of Northwest Gas and Electric Shovels used in quarries has probably done more to influence Northwest sales in other fields than any other one thing. The next page explains why the Northwest is qualified for the hardest of shovel jobs.

The **NORTHWEST SHOVEL**

Gas or Electric

More information on next page

More digging power

THE outstanding success of the Northwest in stone quarries is explained by a number of revolutionary features.

Foremost among these is the simple arrangement of cables, which eliminates gears, racks, pinions, auxiliary motors and auxiliary drives. This arrangement makes available the full hoisting power of the 57 h. p. Climax gas engine—an engine that is always more than equal to the heaviest tax—for digging. Unlike other shovels, there is no reduction of hoisting power when digging.

Ideal flexibility in every operation — thrusting in or out, swinging, and shaking the dipper—is provided by this simple mechanism, and it is added to by the Northwest patented steering device that makes the crawler as easy to handle and steer as a tractor. The bucket is ¾-yard capacity and has reversible manganese teeth. The coupon below will bring additional specifications. Why delay?

The NORTHWEST SHOVEL

One Motor — Gas or Electric

Northwest Engineering Company
Chicago, Ill.

Also manufacturers of Northwest Crawler Cranes and Dragline

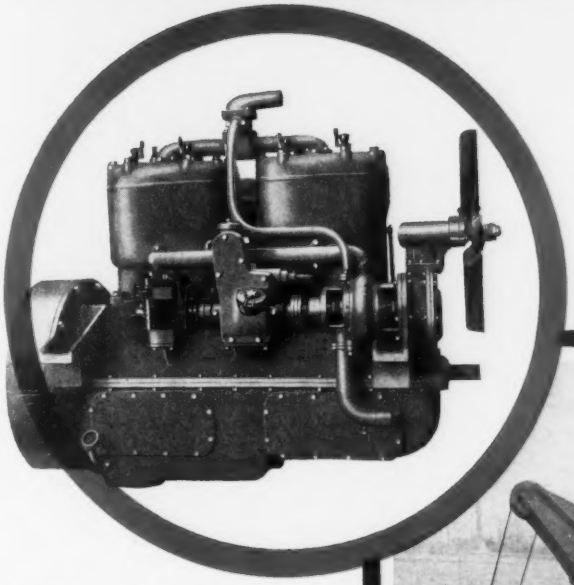
For information mail this coupon to the Northwest Engineering Co., Chicago, Ill. Check equipment in which you are interested.

☐ Northwest Gas Shovel
☐ Northwest Dragline
☐ Have representative call

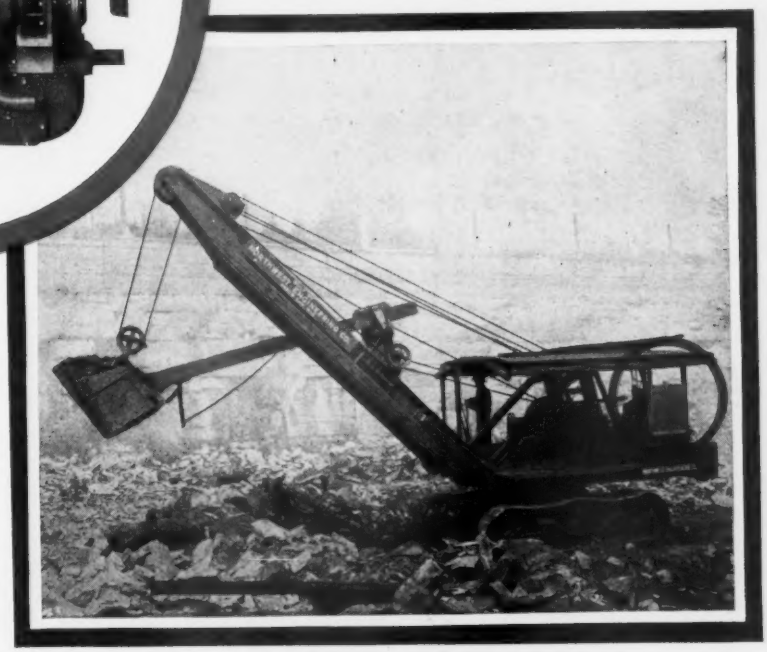
☐ Northwest Electric Shovel
☐ Northwest Crane
☐ Send details

Address .....

"Always More Than Equal To The Heaviest Task"



says the
Northwest Engineering Co.
of the Power Equipment
Used in Their Shovels



Moderate Speed
Heavy Duty
Kerosene or
Gasoline

Illustration at right shows Northwest Crawler-Shovel — "The Shovel with One Motor" —¾-yard Struck Measure.

Made by Northwest Engineering Co., Chicago, Ill.

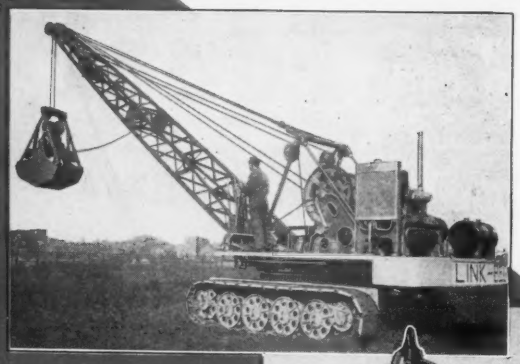
NORTHWEST SHOVEL

Gets Its Dependable Power from

CLIMAX

"The Trustworthy Engine"

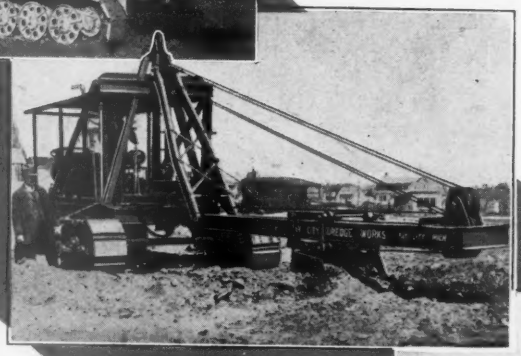
MADE BY **CLIMAX ENGINEERING CO.** 22 W. 18th AVE. CLINTON, IOWA



Standard 20-Ton Crawler Type Crane. Made by Link-Belt Co., Chicago

CLIMAX
TRUSTWORTHY
ENGINES

Are Standard Equipment in The Best Cranes



No Regular User of

CLIMAX

ENGINES

Has Ever Changed To Any Other Make

Bay City Crane-Excavator—one-man operated. Loads 60 cubic yards per hour into trucks and wagons. Made by Bay City Dredge Works, Bay City, Mich.

12-ton Type E Crawler Crane, made by Orton & Steinbrenner Co., Huntington, Ind.

More Work Hours Per Dollar

Fewer Trouble Hours Per Year

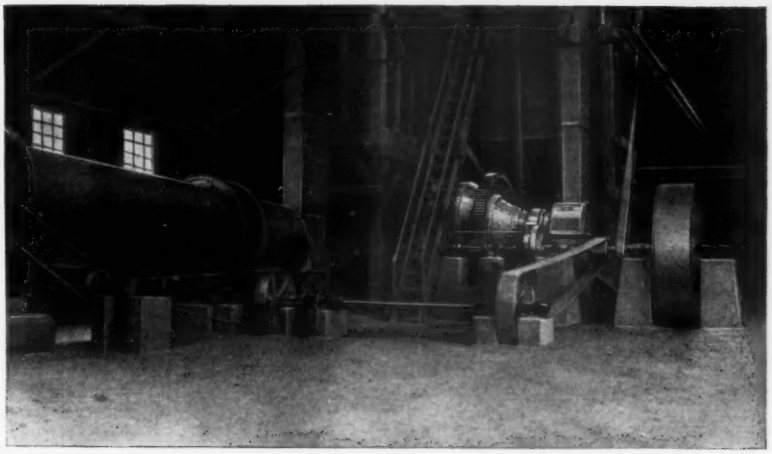
Standard Type Road Crane, made by Locomotive Crane Co. of America, Champaign, Ill.

Write for Catalog

Standard Crawler Type Crane, made by Byers Machine Co., Ravenna, O.

Climax Engineering Co.

22 W. 18th Ave., Clinton, Iowa



Boosting the Price of Limestone

Here is a way to take your screenings, grind them and sell them for from two to four times the amount they would otherwise bring.

You know there is a market for ground agricultural limestone, but do you know there are also other uses commanding even a better price?

For instance, finely ground limestone is extensively used as a filler for asphalt paving and commands a better price than does the ordinary agricultural limestone.

Write us and we will give you some interesting information not only in connection with the uses for limestone but how best to grind it.

It is the cost of grinding and flexibility of the plant to handle various products that determine whether or not the project will be practical.

HARDINGE COMPANY
120 BROADWAY, NEW YORK, N.Y.
BRANCH OFFICES
SALT LAKE CITY, UTAH: NEWHOUSE BUILDING
LONDON, ENGLAND: 11 SOUTHAMPTON ROW

Hardinge Conical Mills

When writing advertisers please mention ROCK PRODUCTS

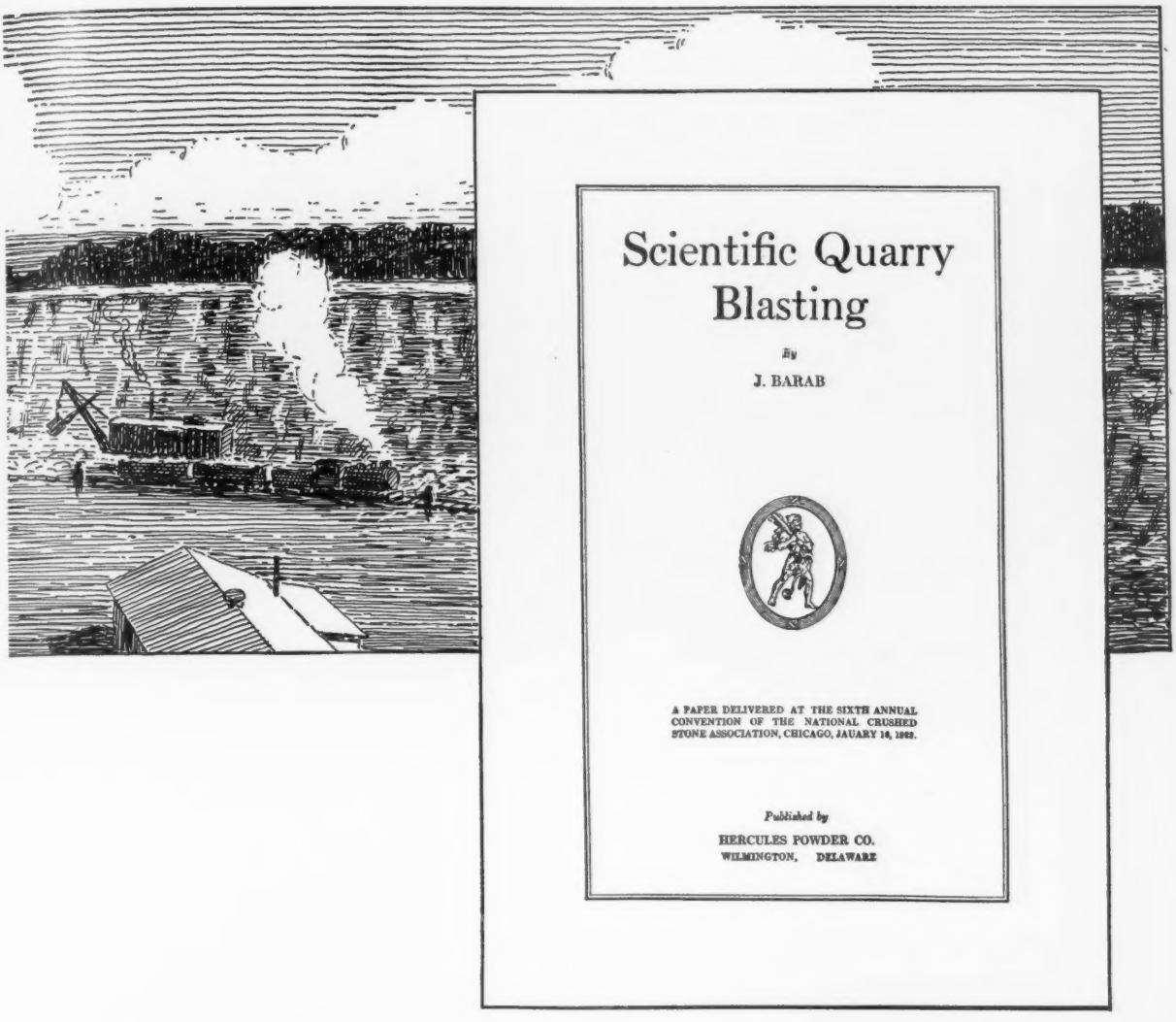
Avoid Guesswork—

This Bulletin Will Help

A hand level and a tape are all you need to calculate accurately the correct amount and distribution of explosives for most quarry shots.

No matter how high or how sloping the quarry face may be, you can find the burden on each hole by a simple method described in "Scientific Quarry Blasting." Once this is known, you can load with such more certainty of obtaining good results.

Guesswork is often relied upon in loading well-drilled holes, but even when the guess is based on long experience, it seldom attains scientific accuracy. A little figuring beforehand will save a lot more than the cost of the time it takes to do it.



Every quarryman should have a copy of this bulletin, which is published by the Hercules Powder Co. Other chapters discuss the comparative effect of different explosives in both pocket and column loading and special methods by which unusual blasting problems have been solved. It also gives record systems used at many quarries and a set of useful tables. Write for a free copy to our Advertising Dept. 945 King St., Wilmington, Del.

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PENNSYLVANI

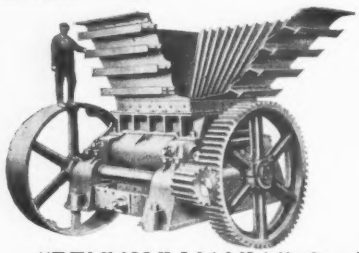
for Primary, Seconda y Limestone, Cement Rock,

PRODUCTS

"PENNSYLVANIA" Giant Single Roll Primary Crushers for Limestone, Cement Rock, Lump Lime, Gypsum and Shale.

"PENNSYLVANIA" Hammer Crushers—SUPER, THOR, AJAX, SAMSON and TROJAN Series for Secondary and Finer Reductions of these materials and R. O. M. Bituminous Coal.

"PENNSYLVANIA" Armorframe Single Roll Coal Crushers for preparing Gas Producer and Stoker Coal.

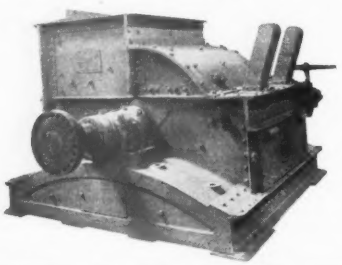


"PENNSYLVANIA" GIANT Single Roll Crushers are built in capacities ranging from 200 to 600 tons hourly for primary crushing and smaller sizes for secondary reductions.

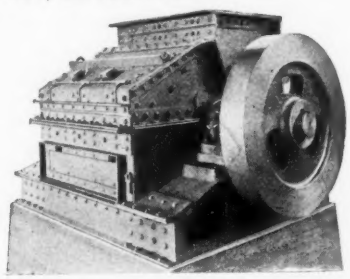
"PENNSYLVANIA" Single Rolls are simple, powerful, self-feeding Crushers which make maximum reduction in one operation to relatively uniform product. The H. P., headroom, attendant labor, maintenance and fines produced are minimum. The few parts are readily accessible. Crushers are adjustable and thoroughly protected against "Tramp Iron."

Bulletins 1003 and 1005

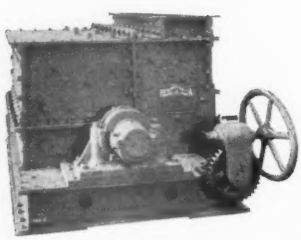
"PENNSYLVANIA" Steel-built Hammer Mills are furnished in 5 Series for secondary and finer reductions in heavy-duty Cement and Lime Plant service, as follows:—



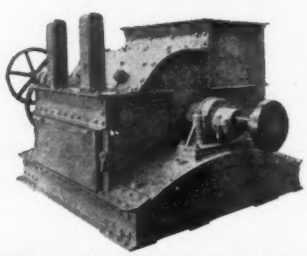
"PENNSYLVANIA" THOR SERIES
SERVICE: 8 in. to 15 in. feed, reducing to ½ in. and under product
CAPACITIES: 75 to 400 tons hourly
Bulletin 1005



"PENNSYLVANIA" SUPER Series
SERVICE: 12 in. to 24 in. feed, reducing as fine as ¾ in. and under in one operation
CAPACITIES: 100 to 500 tons hourly
Bulletin 1005



"PENNSYLVANIA" SAMSON Series
SERVICE: 2 in. to 5 in. feed, reducing to ⅛ in., also 20 mesh
CAPACITIES: 15 to 150 tons hourly
Bulletin 1005

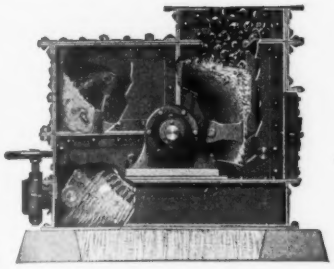


"PENNSYLVANIA" AJAX Series
SERVICE: 4 in. to 12 in. feed, reducing down as fine as ¼ in.
CAPACITIES: 45 to 300 tons hourly
Bulletin 1005

NOTE—New Branch Office, Monadnock Bldg., Chicago, C. S. Darling, Mgr.

NIA CRUSHERS

and Finer Reductions of Gypsum, Lump Lime and Coal



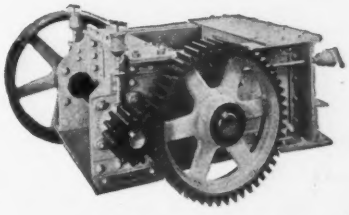
Distinctive "PENNSYLVANIA" Features:

Heavy Fabricated Unbreakable Steel Frames
Adjustable (except Super) Steel Cages
Patented Tramp Iron Separator
Oversize Heavy Duty Bearings
Adjustable Breaker Plates
Powerful All-Steel Rotors
All Steel Internal Parts
Capacities ranging from 2 to 500 tons hourly

Bulletin 1005

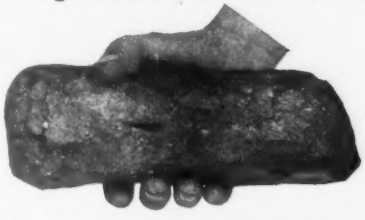
"PENNSYLVANIA" Single Roll Coal Crushers are built in capacities of 10 to 400 tons hourly for reducing R. O. M. Bituminous coal to the sizes required by Gas Producers and Automatic Stokers and preparatory for pulverizing.

The design provides slab steel frames in the smaller sizes and heavy box type, sectionalized frames for the larger sizes, reenforced with heavy steel tie rods.



These "PENNSYLVANIA" Coal Crushers are self-feeders and insure a uniform, uninterrupted production, on account of fundamentally correct design, rugged construction, and triple tramp iron production.

Patented Segmental Roll, Spring Suspended Breaker Plate, with special Manganese Renewable Tip, liberal Bearings, Steel Shear Pin Safety Device and powerful, substantial construction throughout characterize the entire line.



This Steel Wedge. weighing 16 pounds, was automatically picked out from Primary Crusher feed without the knowledge of the operator or damage to the SUPER.

"PENNSYLVANIA" PATENTED TRAMP IRON SEPARATOR is optional equipment in all "PENNSYLVANIA" Steel-built Hammer Mills.

PUT YOUR REDUCTION PROBLEMS UP TO US

Send for new Bulletin 1005

PENNSYLVANIA CRUSHER COMPANY

General Offices, Stephen Girard Bldg., Philadelphia, Pa.

Pittsburgh
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Chicago
Monadnock Bldg.

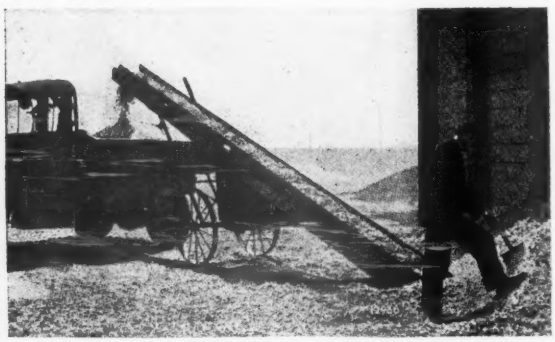
New York
Hudson Terminal

A Tried-and-Proven Line for the Q

An illustration of how the Jeffrey Tanktred Loader fits into the requirements of Quarry Service

STRENGTH and Wearing Qualities determine the value of any equipment used in the Quarry, Sand or Gravel Plant.

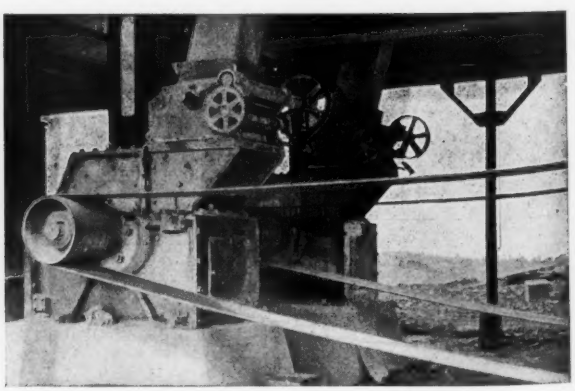
For this necessarily hard service, all equipment designed by Jeffrey Engineers must pass the most rigid tests before it leaves our factory. The Jeffrey reputation for quality products mean too much to overlook any factor that will to any degree lower Jeffrey standards.



The Jeffrey Portable Belt Conveyor successfully meets the demand for a light, inexpensive equipment for hauling loose materials

Jeffrey chemists and metallurgists are constantly on the alert for new combinations and variations in heat treatments, and their developments have almost revolutionized the wearing qualities of metal parts. This means not only long service, but insurance against breakdowns.

Storage Battery Industrial Locomotive. A practical and economical haulage system



Jeffrey Type "D" Swing Hammer Pulverizers reducing limestone for agricultural purposes

Quarry, Sand or Gravel Plant

Jeffrey Standard Material Handling Machinery Includes:

Portable Bucket Type Loaders, Tanktred and Radial Types, capacities 1½ to 2 cubic yards per minute.

Portable Belt Conveyors, in various lengths and adapted to various heights.

Bucket Elevators, 56 standard sizes ranging in capacity from 6½ to 80 tons per hour.

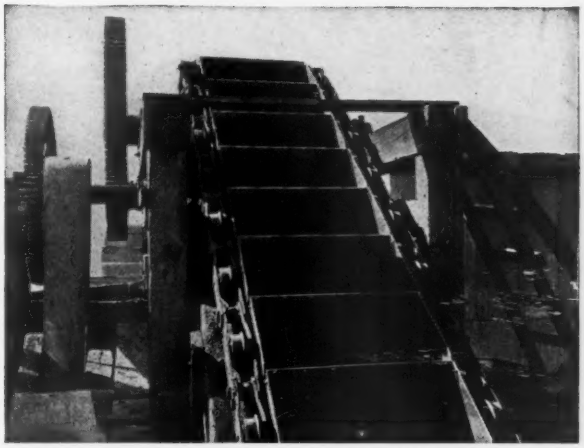
Conveyors, of the Rubber Belt, Bucket, Pan, Apron, Drag Chain, Spiral, Scraper and other types.

Coal and Ashes Handling Equipments; Skip Hoists; Car Hauls; Power Shovels, etc.

Swing Hammer Pulverizers; Manganoid Grinding Balls and Linings for Tube Mills; Coal Crushers, etc.

Industrial and Mine Locomotives, Storage Battery and Trolley Types.

Over 40 years of Jeffrey experience is at your command. Get in touch with a Jeffrey representative and let him help you to plan for low-cost handling in your plant.



Heavy Duty Continuous Bucket Elevator equipped with two strands of Steel Knuckle Chain, each with a working strength of 25,000 pounds

Belt Conveyor handling limestone from quarry to crusher building

The Jeffrey Mfg. Co., 935-99 North Fourth Street Columbus, Ohio

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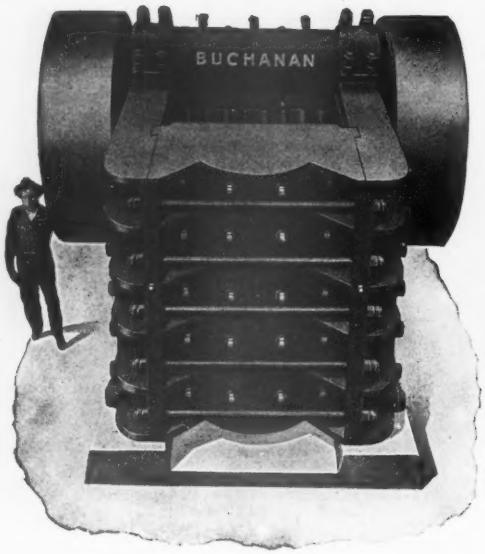
JEFFREY
MATERIAL HANDLING MACHINERY

When writing advertisers please mention ROCK PRODUCTS

Buchanan All-Steel Jaw Crushers



Type "C" Jaw Crusher

Illustration shows BUCHANAN "All-Steel" Jaw Crusher, with frame of reinforced construction, intended for heavy and continuous duty encountered in large operations.

Manganese Steel Jaw Plates are made sectional.

Pitman: A scientifically designed steel casting of proven strength; perfectly balanced weight floated on springs, and friction reduced to a minimum.

Steel castings are carefully annealed and all shrinkage strains are entirely removed. Bearings have double system of lubrication, are water-jacketed, and in the larger sizes are removable.

Built in sizes from 24 in. x 36 in. to 66 in. x 84 in.

Write for Bulletin No. 10

Type "C" is the ideal crusher for preliminary breaking. It should be followed by Type "B" crushers for secondary and finishing operations to small sizes.

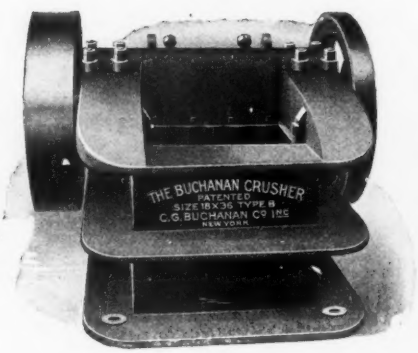
Type "B" Jaw Crusher

Frame is a solid casting of Open Hearth Steel in one piece, having a tensile strength of 60,000 to 65,000 lbs. per square inch, three or four times stronger than cast iron and with at least three or four times the rigidity of the built-up rolled steel plate crusher.

Jaw and Cheek Plates are of the best Manganese Steel, made reversible for double wear—Adjustable Jaw Stroke—Shim Adjustment—Safety Toggle—Reversible Steel Toggle Seats—Phosphor Bronze Frame Bearings (in smaller sizes), —Steel Swing Jaw and Pitman—Pitman Water-Jacketed and Parting in larger sizes.

Built in sizes from 4 in. x 12 in. to 18 in. x 36 in.

Write for Bulletin No. 9



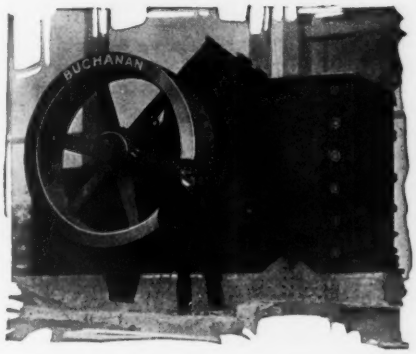
PRODUCTS

Crushers—Crushing Rolls—Complete Crushing Plants

C. G. BUCHANAN COMPANY, INC.

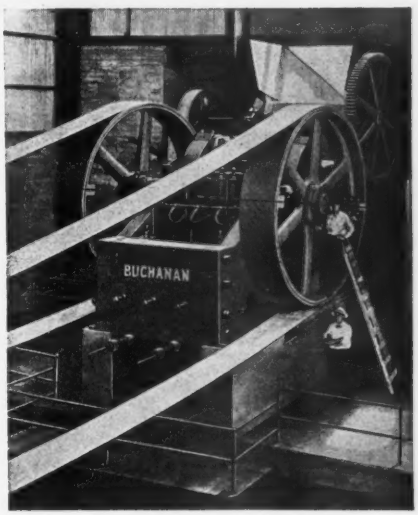
Cedar and West Streets **New York, N. Y.**

Installations Where Buchanan All-Steel Crushers Are Used As Primary Breakers

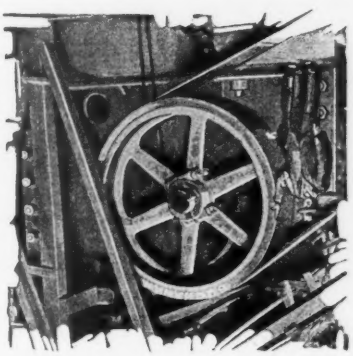


Extracts from letters written by users of BUCHANAN Type "C" Crushers located in this country, Canada and abroad.

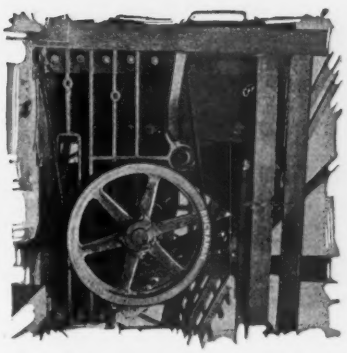
"We are all agreed that the BUCHANAN crusher is, from a mechanical point of view, the only real machine we have got. It gets no special attention (it evidently does not require it) and yet, today, after crushing over 100,000 tons of this particularly tough stone, it is running as quietly and well as when it commenced. We have never had a heated bearing and that is where all the other large crushers made in this country failed. It is practically noiseless and that means good work in a crusher. Messrs. Buchanan seem to concentrate all their attention on parts that matter."



"We have a 42 in. x 54 in. size BUCHANAN crusher working here. It was installed in August, 1920, and has been working five days per week without a break, crushing hard trap rock. The rock is dumped in six ton loads containing at times a large proportion of the bigger sizes, and the jaws are set to crush to 7 in. This crusher has never given us the slightest trouble. It is a massive machine, well designed and built, and of ample proportions for the work it has to do. We have no hesitation in saying that this is the best machine of its type which we have seen."



"This crusher has given complete satisfaction since its installation in 1916; first period on fifth level and second period on eighth level."



C. G. BUCHANAN COMPANY, INC.

Cedar and West Streets **New York, N. Y.**

TAYLOR-WHARTON IRON & STEEL CO.

FOUNDED 1742

High Bridge, New Jersey, U. S. A.

Cable Address "TISCOSTEEL," New York — Codes, Western Union, ABC

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SAN FRANCISCO—605 Insurance Exchange Building
BOSTON—201 Devonshire Street
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CHICAGO—208 South LaSalle Street
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Trade Mark

TISCO MANGANESE STEEL

Reg. in U. S. Pat. Off.

PRODUCTS

TISCO Manganese Steel castings used in wearing parts of all makes of jaw and gyratory crushers, pulverizers, hammer mills, screens, steam shovels, dredges, suction pumps, elevators and conveyors and similar machinery subjected to severe service.

TISCO MANGANESE STEEL PHYSICAL PROPERTIES

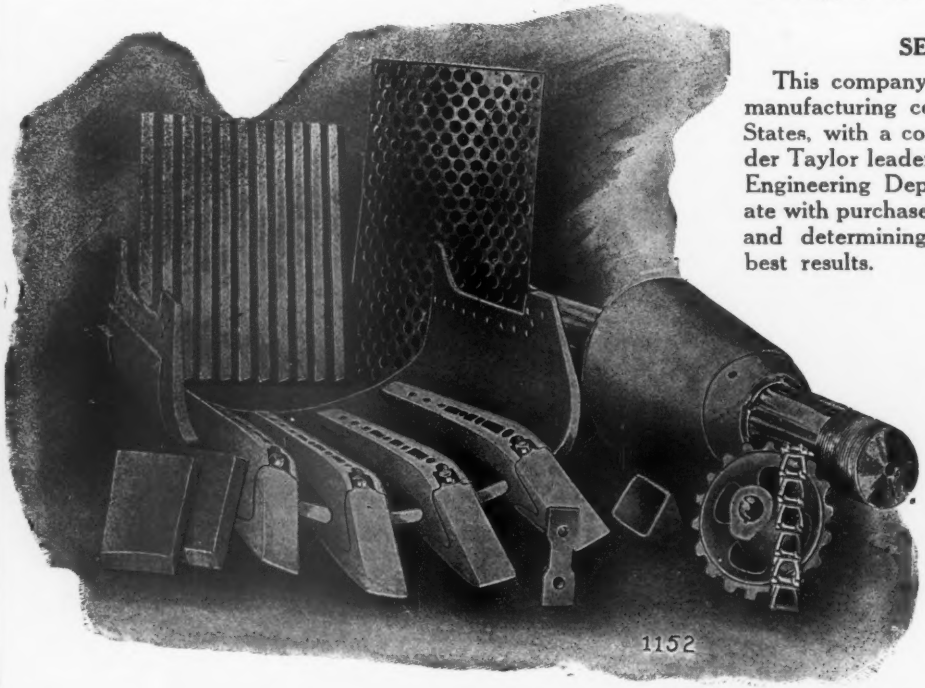
Manganese Steel was first successfully produced in the United States by this company in 1892 under exclusive license of the Hadfield patents. It contains 11 per cent to 14 per cent manganese and 1.00 per cent to 1.30 per cent carbon. It is non-magnetic and not commercially machinable with cutting tools. All finishing must be done by grinding. When properly heat-treated, castings are very tough.

ADVANTAGES

TISCO Manganese Steel may be used to great advantage for castings subjected to shock, heavy wear and abrasive action. Its wear-hardness is remarkable. It should be used where time is such an important factor that the cost of a shutdown for replacement means more than the first cost of repair parts.

USES

TISCO Manganese Steel has found its most noteworthy uses in the construction of all crushing, pulverizing, screening and digging machinery. It is particularly adapted to the requirements of the producer of crushed stone, sand and gravel. We furnish roll shells, wearing parts for jaw and gyratory crushers, hammer mills, pulverizers, suction pump parts, gears of all kinds, elevating and conveying chain and sprockets, screen plates, complete steam shovel dippers, dredge buckets and lips, TISCO Manganese Steel patented two-part reversible dipper teeth.



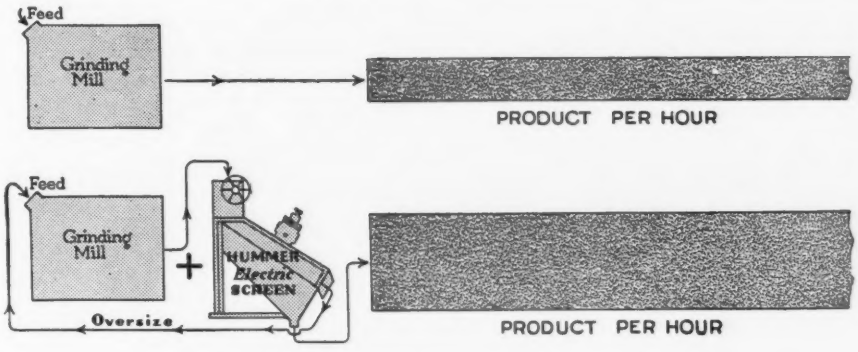
SERVICE

This company is one of the oldest manufacturing concerns in the United States, with a continuous existence under Taylor leadership since 1742. Our Engineering Department will co-operate with purchasers in solving problems and determining how to obtain the best results.

NOTICE!

TISCO Manganese Steel is manufactured under the Taylor-Hadfield and Howe and Hibbard systems. This company controls the Howe and Hibbard basic patents for the production of Manganese Steel in the electric furnace.

Screening for Profit!



Make one mill do the work of two!

with the same power
with the same up-keep

Type 31
6-Foot, Two Surface
HUM-MER *Electric* Screen

THE output of many grinding mills can be increased as much as 100% by taking out internal screens, increasing the feed to the mill, and using HUM-MER Electric Screens to do the screening.

And this with the same power and up-keep.

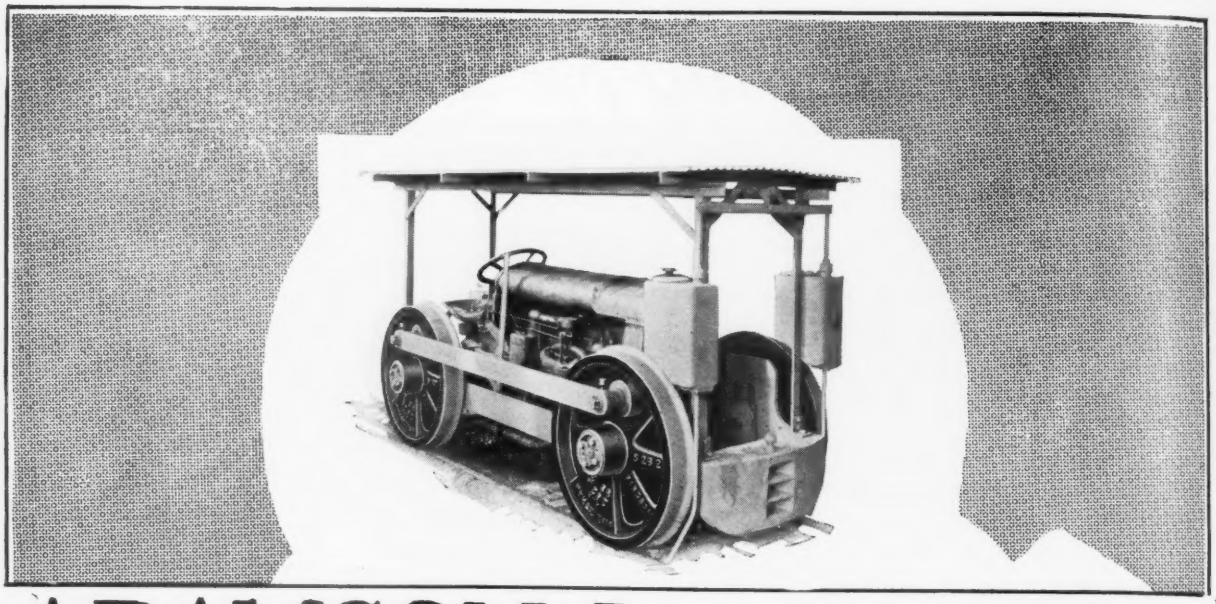
Screening and crushing are two separate operations and should never be joined. Where internal screens are used, the grinding mill is limited to the capacity of the screen, in many cases practically cutting the output in two.

Where HUM-MERS are used behind grinding mills, there are no internal screens to interfere with the tonnage—the mill can be fed to the limit, and the HUM-MER will remove the fines from the coarse, returning the oversize for further grinding.

Let us show you how to reap profits by installing HUM-MER Electric Screens. Send for Catalogue 45-R

THE W. S. TYLER COMPANY, *Cleveland, Ohio*

Manufacturers of **Woven Wire Screens and Screening Equipment**



ADAMSON Locomotive

Built on a Fordson Tractor-

Parts are built standard, the different gauges being accommodated in the changes of the wheels. The tractor is not mutilated and all Ford dealers can render service.

They have been sold and are increasing efficiency and reducing cost for Industries in many states and countries.

We can supply attachment only or locomotive complete in from 36 to 56 gauge.

ADAMSON MOTOR COMPANY

Birmingham, Ala.

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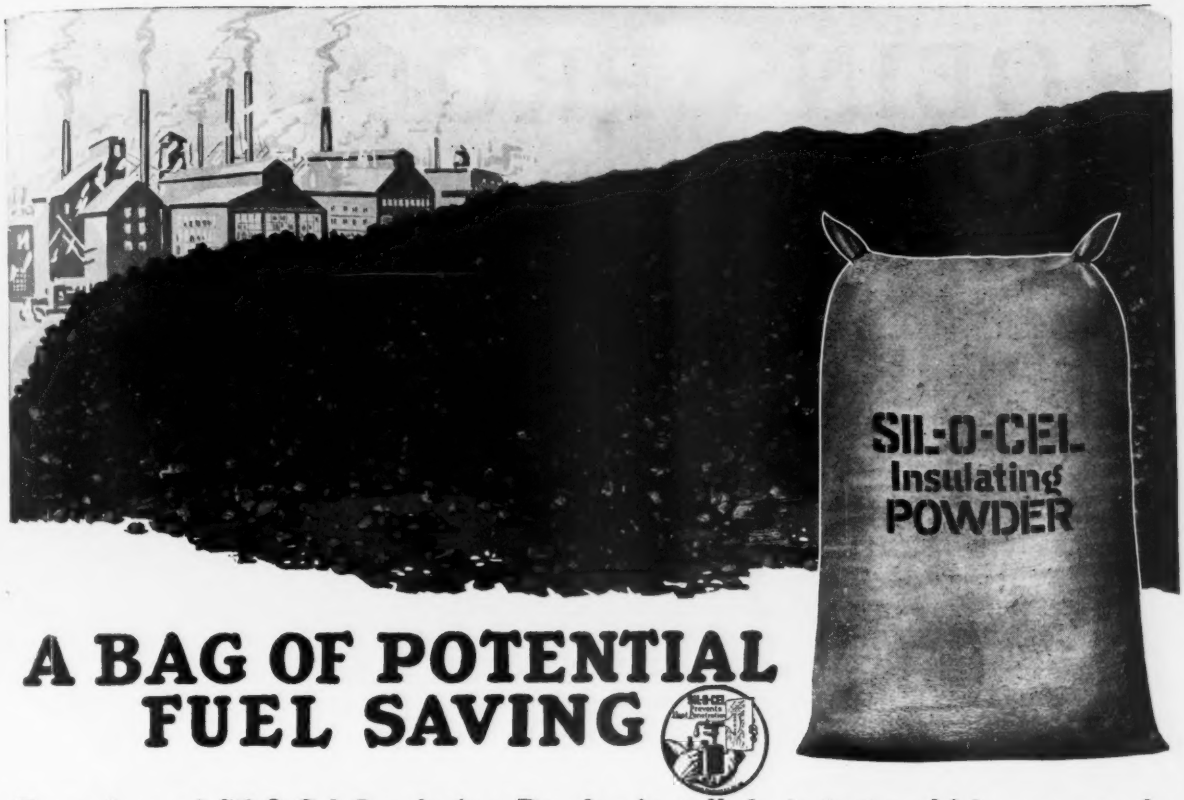

A BAG OF POTENTIAL FUEL SAVING

Every bag of Sil-O-Cel Insulating Powder installed six inches thick covers twelve square feet of heated surface, reduces radiation losses to a minimum, and by holding productive heat within the equipment, effects an appreciable saving in fuel. In fuel saving alone, Sil-O-Cel Insulating Powder pays for installation in from three to four months and greatly lowers production costs

SIL-O-CEL
PREVENTS HEAT PENETRATION
A CELITE PRODUCT

Insulating Powder

is a light weight, siliceous form of heat insulation possessing a greater resistance to heat flow than any other known material. Its convenient form makes insulation practical for all types of equipment, regardless of shape or contour. Not only does it save fuel, but also maintains uniform temperature and facilitates temperature control.

Stocks are carried at convenient warehouses throughout the country for immediate shipment. Sil-O-Cel Insulating Powder is low in cost and is easily applied.

Insulate and Conserve

Sil-O-Cel Heat Insulation is in world-wide service on all types of high temperature equipment. Furnished in the form of Brick, Block, Powder and Cement.

Complete information gladly supplied upon request. Write for Bulletin S-6C or use the coupon.

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CELITE PRODUCTS LIMITED, New Birks Bldg., Montreal, Canada

CELITE PRODUCTS COMPANY,

Gentlemen: Send Bulletin S-6 C and explain in detail the advantages of SIL-O-CEL Insulation, how it saves fuel, increases capacity and maintains even temperatures. I am particularly interested in the insulation

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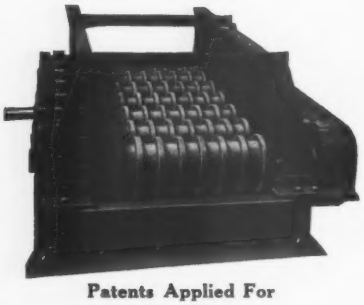
ROBINS PRODUCTS
FOR PIT AND QUARRY

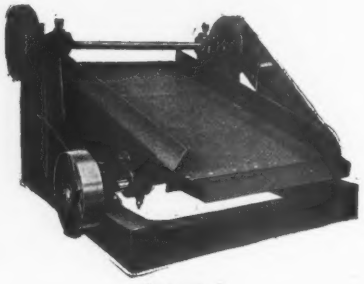


Patents Applied For

The Robins Cataract Grizzly

For stone crushing plants, will size material 1 in. up to 6 in. It has a capacity of from 50 to 500 tons per hour and requires but a 10 horsepower motor.

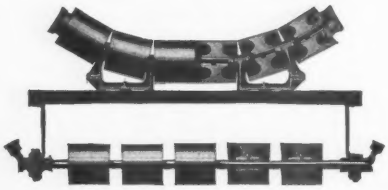
This machine is a development that has solved the problem of how to produce a perfectly sized product at a low cost. It is ruggedly constructed, occupies small space, gives a clean product and a tonnage far greater than any other screen of the same power requirements.



Patented

The "Grasshopper" Shaking Screen

for sand, gravel and small stone. Produces a perfect product and is absolutely free from vibration. When furnished with a double deck will give three sizes. Can be installed anywhere. Operates with 5 horsepower motor. Write for bulletin No. 58.



Robins Standard 5-pulley Idlers

in all sizes from 12 in. to 60 in. All pulleys in same vertical plane. Friction and roller bearing types with grease cups or "Alemite" fittings.

ALL TYPES OF GATES. Single and Duplex Cut-off that are rugged and inexpensive. Made in all standard sizes.

The Robins Troughed Belt Portable Conveyor

for sand, gravel and crushed stone. Ruggedly constructed. Low in price. Write for bulletin.

Patent Applied For

ROBINS CONVEYING BELT COMPANY

New York :: Chicago

Birmingham El Paso Pittsburgh
Boston Los Angeles Salt Lake City
Denver Philadelphia St Louis

I'd like to write one of these letters to you, too

When requests come in each day to send samples of Knox Valves and Couplings, I send the samples of course; but I also send a letter with them, making a lot of important claims which I know the samples will prove.

And because the samples *do* prove my claims I can most generally count on steady repeat orders.

So don't you see that although I am naturally interested in all the repeat orders that come in, I am particularly keen to get new people to try out these Knox Specialties?

When they do, they, too, become repeat customers; and the list of satisfied users grows each day.

The reason is simply this: My Knox Valves and Couplings are as good as money can buy—and they cost you less. They will not leak under highest working pressures, they cannot injure your hose, and rough handling will not hurt them. Better valves and better couplings for less money—what more could I say?

So let me add your name to this ever-growing list of Knox users. Mark what you want on the coupon in the corner, and send it in.

KNOX MANUFACTURING COMPANY

Philadelphia, Pa., U. S. A.

TYPICAL LIST OF PROMINENT USERS

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Atlas Portland Cement Company, Hamburg, N. J.
Calumet & Arizona Mining Co., Bisbee, Arizona
The Dome Mines Company, Ltd., South Porcupine, Ont., Can.
Goldfield Cons. Mines Co., Goldfield, Nevada
M. A. Hanna & Company, Duluth, Minn.
The International Nickel Co. of Canada, Copper Cliff, Ont., Can.
Menantico Sand & Gravel Company, Millville, N. J.
Palermo Sand & Stone Company Ocean City, N. J.
Phelps, Dodge Corporation, Lowell, Arizona
Portland Contracting Company, Pottsville, Pa.
Ulen Contracting Company, Shandaken, N. Y.

KNOX

Valves-Couplings-Nipples-Clamps-Menders

The Story of Margaret Githens

The President, General Manager and Owner of the Knox Manufacturing Company is Miss Margaret Githens. Miss Githens is not only responsible for the proper manufacturing methods of her company, but also has entire charge of her company's sales policy. Through her foresight, ingenuity and pluck, the business has grown by leaps and bounds; Knox Specialties have grown in demand; and Miss Githens' reputation as a highly competent, well thought of business woman is now enthusiastically proclaimed by many of the most influential mining companies in the country.

FREE TRIAL COUPON

Miss Margaret Githens
The Knox Mfg. Co., Philadelphia, Pa.
Send me sample valve and coupling for trial in our mine. Send them to me on the condition that I will return them—**without** paying for them—if I am in any way dissatisfied with the products or their price.

Size_____(¼ in. to 3 in.)

Name_____

Company_____

Address_____

QUARRY CAR PRACTICE

EASTON INDUSTRIAL CARS

Get Your Copy!

Under the title of "Quarry Car Practice" we are publishing a series of bulletins, now totaling one hundred and twenty pages, covering our investigation of Quarry Work under many conditions.

It is an authoritative, unbiased, profusely illustrated story of actual experience in quarries throughout the country. We want to place this record in the hands of every interested quarry man.

You cannot fail to be helped in your own problems by studying this data and we have tried to make it easy for you to get by providing the coupon printed on this page. Don't you want it?

Then Use the Coupon!

The ability of Easton Quarry Cars to deliver continuous good service under the tremendous punishment of quarry work is not the result of mere draughting room consultation or a limited experience in handling plates and shapes. It is due to a fundamental knowledge of exactly what a quarry car has to do, obtained by long and patient observation in hundreds of quarries.

This Book Shows You!

Use the Coupon on Opposite Page

EASTON CAR & CONS'T'N CO

Main Office and Works at 28 Holley Street, Easton, Pennsylvania

AGENTS IN:

New York	Pittsburgh	Birmingham	St. Louis	Los Angeles
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Harrisburg	Savannah	Spartansburg	Davenport	Houston
				Salt Lake City

EASTON QUARRY CARS

Forty Pictures in Bulletin 21

And yet, these are but a few of the types we supply.

We make a variety of special quarry cars but conditions vary so widely and to so great an extent that it is unwise and even dangerous to make general recommendations as to types.

A stock type may answer, a modification may meet requirements, or a new and special design may have to be evolved to give economical results. In any event, study and consideration are given to each individual proposition.

Years of experience, constant investigation, continuous progress, and a thoroughly equipped plant with trained personnel are essential to the production of cars that are to remain an investment. It is the combined result of such a staff, such equipment, and such construction that you get in Easton Quarry Cars.

Real Service!

We offer to the fullest extent our co-operation and service in securing for you cars that will continuously provide the character of transportation that efficiency demands. Use the coupon, get the literature, and let us prove it!

Use the Coupon Printed Below

Just fill in your name, company and address. Mail to us and you will receive your copy promptly. If you want any other information on special or standard types of cars, just make a note of it on the last line of the coupon. You incur no obligation and there are no strings tied to this offer—but fill it out, tear it out, and mail it now before you forget!

EASTON CAR & CONSTRUCTION CO., 28 Holley Street, Easton, Pa.

Please send me, without obligation on my part: "Quarry Car Practice," (No. 4) ☐ "Easton Quarrys Cars," (Bulletin 21) ☐

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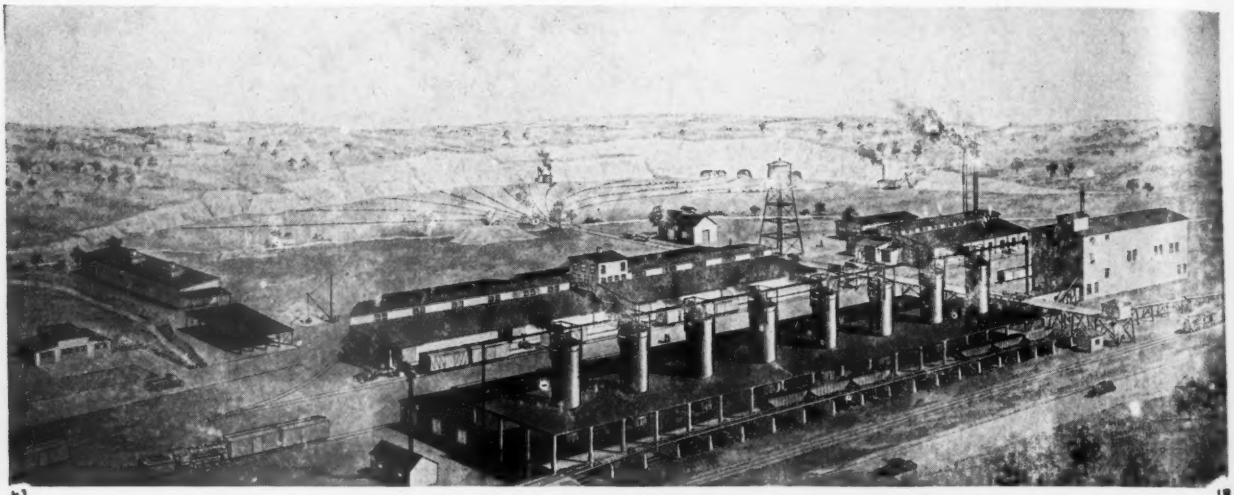


One of the buildings of the Peerless White Lime Co., which is covered with Armco Ingot Iron

Built to Last

When the original buildings of the plant operated by the Peerless White Lime Co., of St. Louis, were destroyed by fire, the company decided to rebuild, using only materials of known lasting qualities.

Among these materials were the galvanized ARMCO-Ingot Iron sheets used to cover the buildings.

By holding off the rust that destroys, this ARMCO product will add its share to the many years these buildings will last.

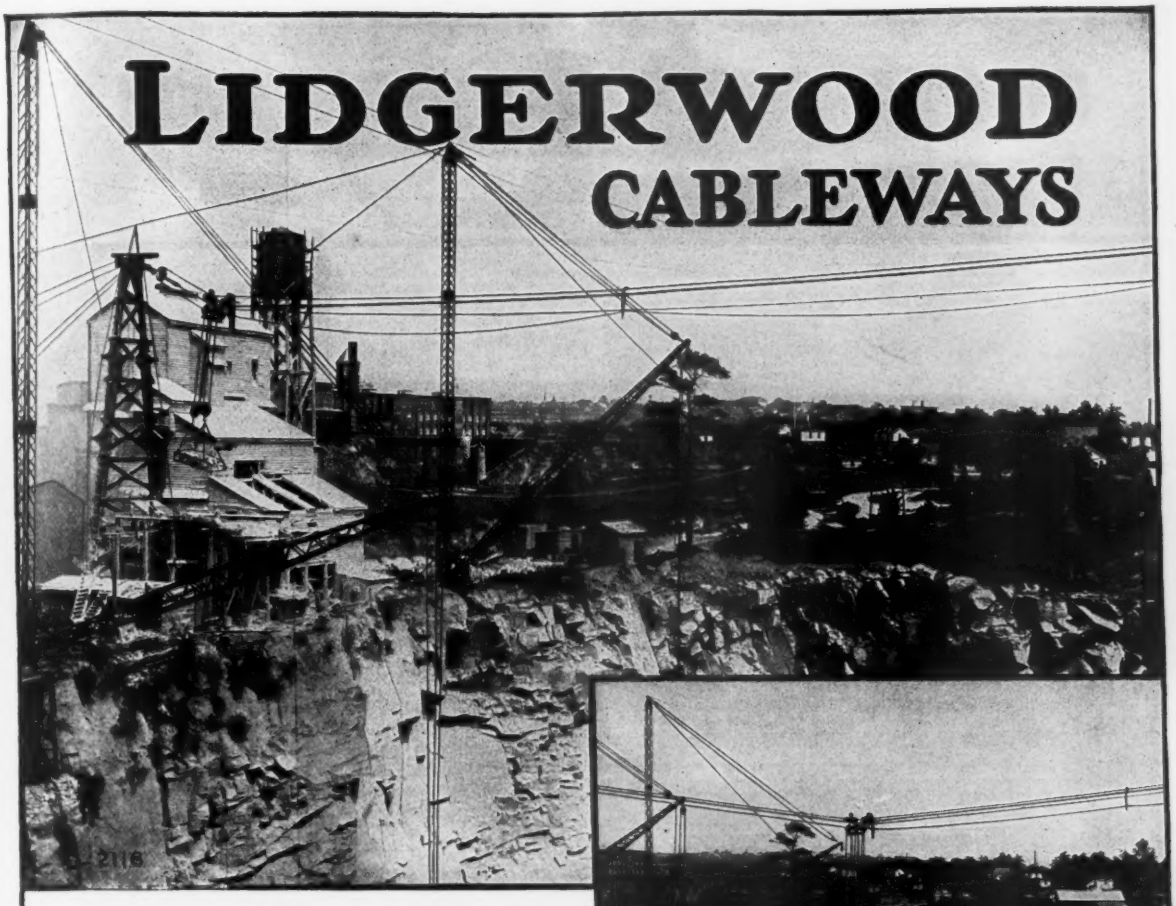
The American Rolling Mill Co.
Middletown, Ohio

TRADE MARK ARMCO REG. U.S. PAT. OFF.

ARMCO
TRADE MARK
INGOT IRON

TRADE MARK ARMCO REG. U.S. PAT. OFF.

LIDGERWOOD CABLEWAYS



FOR QUARRY WORK

These views show a Lidgerwood Cableway in use by the Palmetto Quarries Co., Columbia, S. C. This cableway hoists skips holding ten tons of granite from the quarry floor, conveys and automatically dumps this load directly into the crusher.

These cableways are built in spans up to 1000 ft., with towers stationary or traveling. They excavate sand, gravel, etc., and handle material directly to screens, crushers, or to storage piles.

HOISTS — DERRICKS — CABLEWAYS

Suitable for all Quarry, Pit and Contracting uses

Send for Catalogs

LIDGERWOOD MANUFACTURING COMPANY

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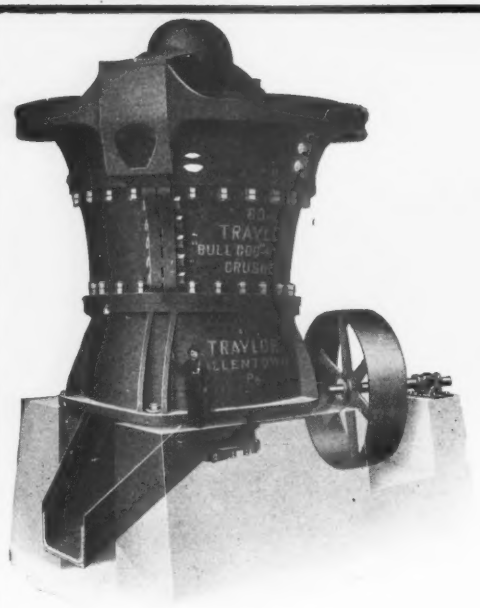
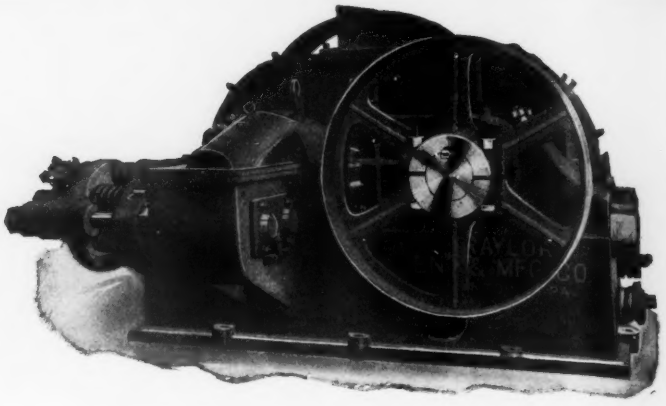
Los Angeles London, England Sao Paulo, Brazil Apartado 812, Mexico, D. F.

GRAY





ENDURINGLY EFFICIENT

As a rule details of design and construction of the Traylor **Bulldog** line of rock crushing equipment are not a matter of discussion when purchase is contemplated. They are accepted as they are, because built by Traylor.

The reason is that Traylor equipment has honestly earned the right to this implicit confidence, due to the superior character of every machine that has ever borne the name.

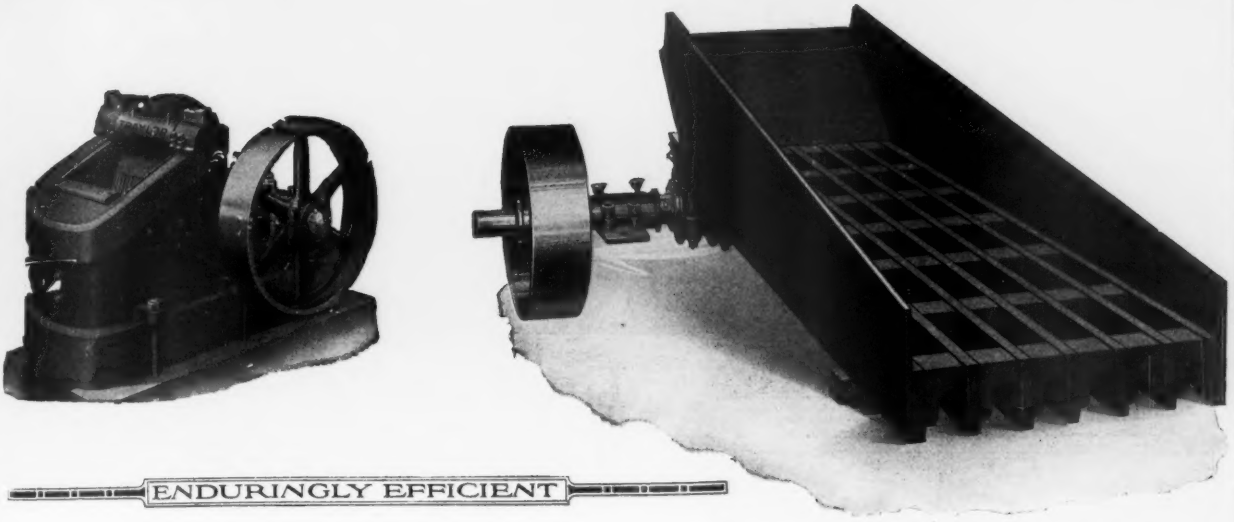
The Traylor Bulldog Gyratory Crusher has five exclusive features that increase efficiency and economy of operation: the non-deflecting shaft, the bar type non-weaving Hewes Spider, cut steel driving gears, extra large self-aligning eccentric bearing and positive force feed lubrication.

Traylor Heavy Duty Crushing Rolls —"The roll with the automatic fleeting device"—are fast superseding all other equipment for fine crushing.

Traylor rolls are furnished with either smooth or corrugated shells and will produce maximum tonnage of finished product for horsepower consumed.

The factors of safety used in design of Traylor rolls are large and these machines are therefore particularly recommended for the abusive service which equipment receives in stone crushing plants.

LORD



ENDURINGLY EFFICIENT

Traylor Bulldog Jaw Crushers have, since their introduction about four years ago, won the very high regard of operators all over the world.

The design of this crusher is unique and sensible—a radical and daring departure from the original Blake. It is the most sensible, responsible and accessible jaw crusher that has ever been offered.

Traylor Bulldog Grizzly Feeder—This feeder is strong, simple and efficient and will enable your initial crusher to operate at maximum capacity because it at all times delivers the right amount of feed in an even stream. "It keeps your crusher's digestion right."

We have the following bulletins all wrapped, ready for your name and address—

Rolls, R-2-R; Gyratory Crushers, 100-R; Jaw Crushers, 99-R; Mills, 103-R; Pumps, 101-R.

Write for your copy today

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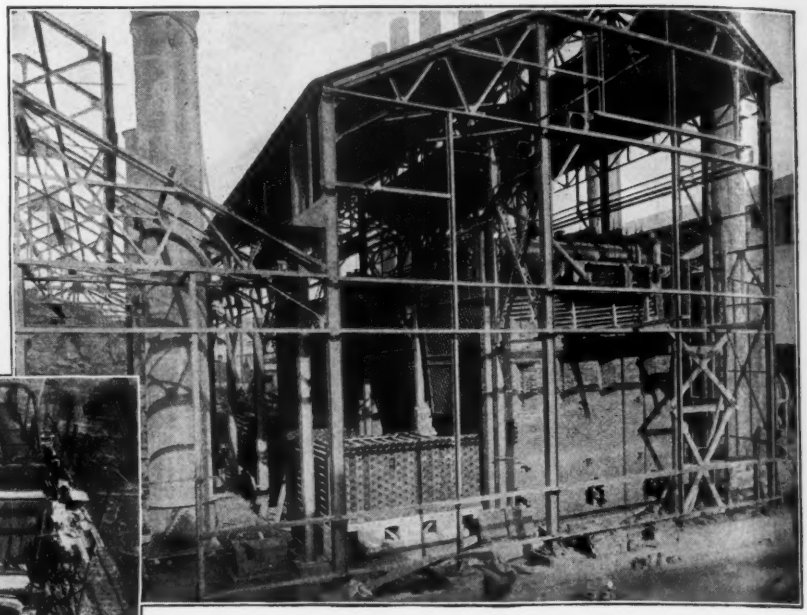
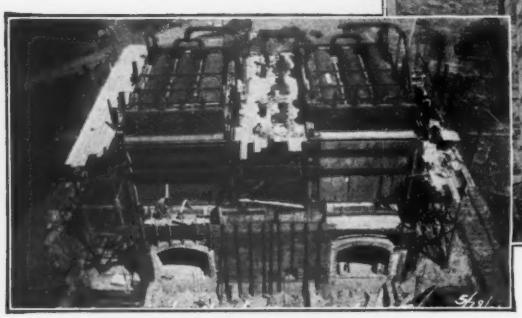
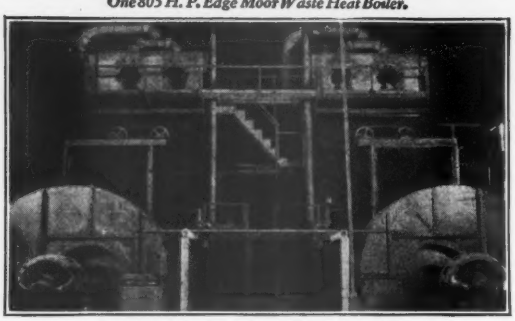


Marquette Cement Mfg. Co., La Salle, Ill. Six 989 H. P. Edge Moor Waste Heat Boilers.



Western States Portland Cement Co., Independence, Kans. Two 1088 H. P. Edge Moor Waste Heat Boilers.

National Cement Co., Philippine Islands. One 805 H. P. Edge Moor Waste Heat Boiler.



Petoskey Portland Cement Co., Petoskey, Mich. Two 638 H. P. Edge Moor Waste Heat Boilers.

Less Fuel—More Power

TWENTY-SEVEN cement mills, including several of the largest in the world, are now operating or installing Edge Moor Waste Heat Systems.

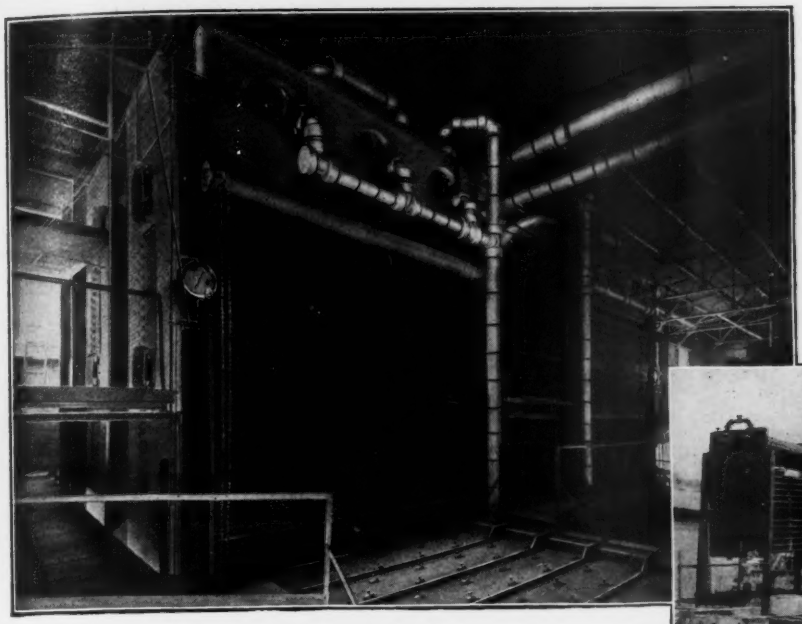
Since 1916, when the first distinctly successful cement mill waste heat system was installed by this company in the Alpha plant at Alsen, N. Y., the conservation of waste heat has become recognized as an essential factor in the efficient operation of modern cement mills.

During this comparatively short period, approximately 60,000 H. P. of Edge Moor Waste Heat Boilers have been installed. This represents over 70% of the waste heat boiler horsepower in the cement industry.

Each Edge Moor Waste Heat System is installed with a definite guarantee of results. All engineering, construction and other installation details are supervised by this company.

EDGE MOOR

FOR INCREASED



Trinity Portland Cement Co., Eagle Ford, Tex. Three 1089 H. P. Edge Moor Waste Heat Boilers.

Alpha Portland Cement Co., Alsen, N. Y. Two 749 H. P. Edge Moor Waste Heat Boilers. Martins Creek, Pa., plant of this company also operates three 749 H. P. Edge Moor Waste Heat Boilers and is now installing four additional 1189 H. P.

—Increased Output

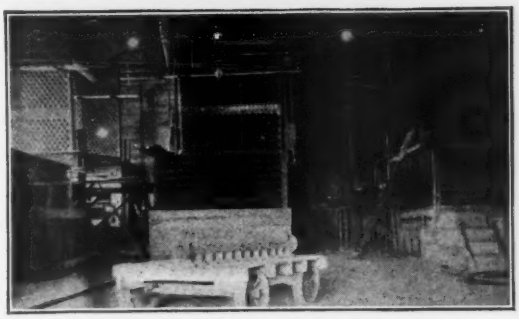
IN addition to the many installations in this country, cement mills in Japan, Argentine, Australia and the Philippine Islands are operating or have ordered Edge Moor Waste Heat Systems.

Besides the plants illustrated on these pages, installations include:

Aetna Portland Cement Co.
Cayuga Operating Co.
Crescent Portland Cement Co.
Dewey Portland Cement Co.
Knickerbocker Portland Cement Co.
Lehigh Portland Cement Co.
Newaygo Portland Cement Co.
Northwestern States Portland Cement Co.
Pittsburgh Plate Glass Co.
Asano Portland Cement Co., Japan (2 plants)
Nagoya Cement Co., Japan
Oita Cement Co., Japan
South Australian Portland Cement Co., Australia
Compania Argentina de Cemento Portland, Argentine

Let us send you complete information about the Edge Moor Waste Heat System.

Hokoku Cement Co., Japan. Two 747 H. P. Edge Moor Waste Heat Boilers.



Hawkeye Portland Cement Co., Des Moines, Ia. Three 805 H. P. Edge Moor Waste Heat Boilers.

EDGE MOOR IRON COMPANY

Established 1868

EDGE MOOR DELAWARE

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FUEL ECONOMY

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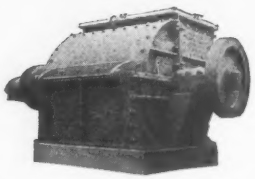
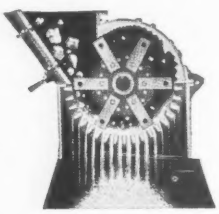
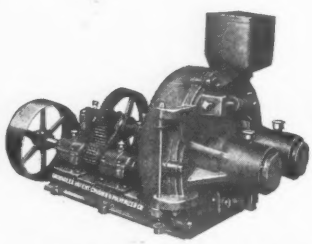
GRUENDLER CRUSHERS



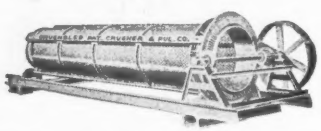
Above is one of the monster Gruendler Swing Hammer Crushers—capacity 200 tons per hour. This crusher has replaced as many as 3 secondary crushers in many plants throughout the country.



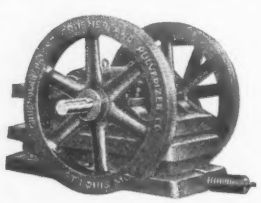
The illustration above shows interior view of the Gruendler Swing Hammer Pulverizer, belt or motor driven. Grinds medium fine preliminary to tube mill or breaking down. With or without automatic feeder.



The Gruendler Roller Mill shown above is for fine grinding of hard materials—comes in 4 sizes.



The illustration shown above is that of the powerful Gruendler Revolving Screen Roller type. All sizes—perforated plates or wire cloth —with dust jacket or housing if desired.



The Gruendler Jaw Crusher shown is especially adapted for preliminary crushing of all hard materials. Semi-steel throughout.

GRUENDLER leadership is best told by the **THOUSANDS** of Crushers, Grinders and Pulverizers now in operation.

Quarry operators everywhere buy them because the initial cost and upkeep is less and the profits larger at the end of the year. Ball-bearing or ring-oiling throughout, they operate at a big saving in horsepower. Few parts and fool proof construction are Gruendler features.

Let Gruendler Engineers Help

Gruendler Engineers are experts in designing complete installations and making recommendations of proper equipment. Thirty-five years of practical experience on **tens of thousands** of samples have made them authorities on all crushing problems. They will be glad to be of service to you—write, outlining your needs.

Gruendler representatives are located in all parts of the country. Write for name and address of the one nearest you.

GRUENDLER PATENT CRUSHER & PULVERIZER COMPANY

908 N. Main St. St. Louis, Mo.

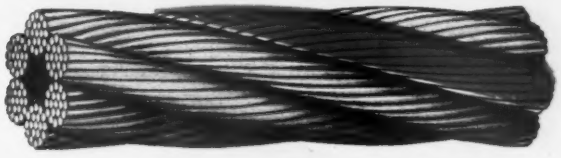
GRUENDLER
CRUSHERS · PULVERIZERS · GRINDERS

"HERCULES" RED STRAND

This cableway is in use at a St. Louis Quarry. The main cable is a 2-in. Leschen Locked Wire Rope. Hoisting lines are Hercules (Red-Strand) Wire Rope

Service Record Proves Quality

For almost half a century HERCULES (Red-Strand) Wire Rope has been used for heavy work of all kinds, and its constant gain in popularity has been largely due to its service record.



If reputation counts; if the judgment of those who have used it counts; if long run economy counts; then Hercules Wire Rope is worthy of the careful consideration of every one who is not familiar with its unusual qualities.

Crushed stone for the Gilboa Dam is carried by this Leschen Friction Grip Tramway. Its capacity is 150 tons per hour

Leschen Aerial Tramways

We design and manufacture Aerial Tramways in various Systems. A Leschen Tramway has solved many transportation problems. It may solve yours.

Your Inquiries are Solicited

Established 1857

A. Leschen & Sons Rope Co.

5909 Kennerly Avenue ST. LOUIS, MO.

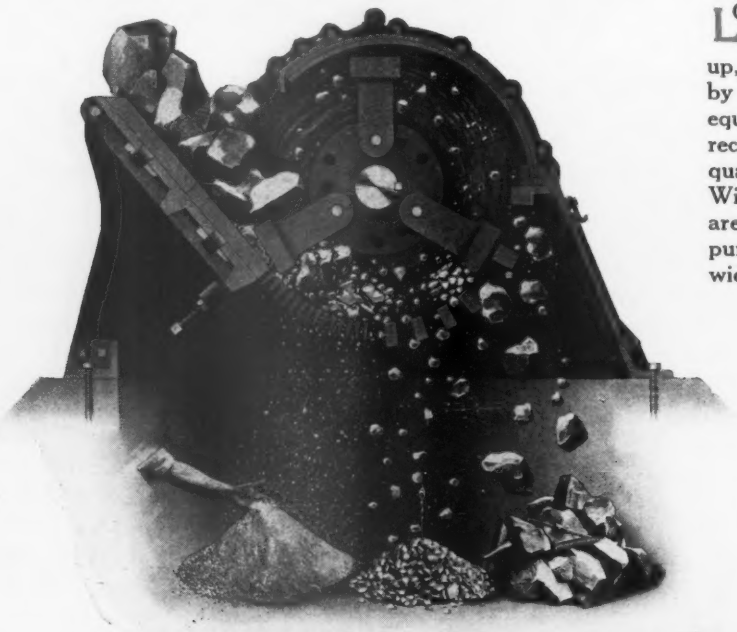
New York Chicago Denver San Francisco

WIRE ROPE

Fewer Operations

48" Limestone to 1½" "Saved $20,000.00 in investment —cut crushing costs 53 per cent and saving $4600.00 yearly in operating expense."
JOHN HERZOG & SON, Forest, Ohio.

Lime "Williams hammer crusher reducing 1920 pounds per minute of 1" to 8" burned lime to coarse dust. Have not had one minute of trouble with it."
LUCKEY LIME & SUPPLY CO., Luckey, Ohio.



LOWER CRUSHING COSTS—less money invested—simplified operations. Summed up, these are the PROVED results obtained by the use of Williams' Hinged Hammer equipment. Proved by actual performance records in prominent lime and gypsum plants, quarries and most American cement plants. Williams' hammer crushers and pulverizers are built in sizes and types for every reduction purpose. The following are a few of the most widely used types.

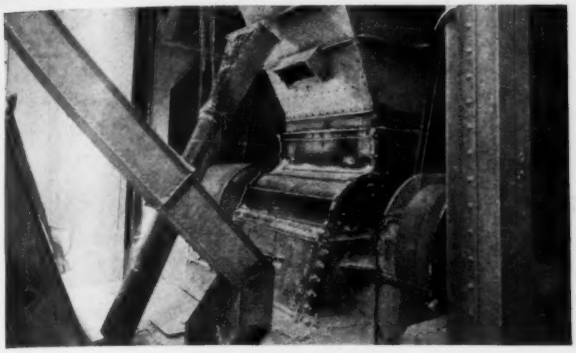
The Mammoth

Crushes 48" limestone to 1½" in one operation, also to 6" for kiln stone. Size of crushed material adjustable by operator. Takes the place of preliminary crusher and secondary crushers with their connecting elevators and conveyors.

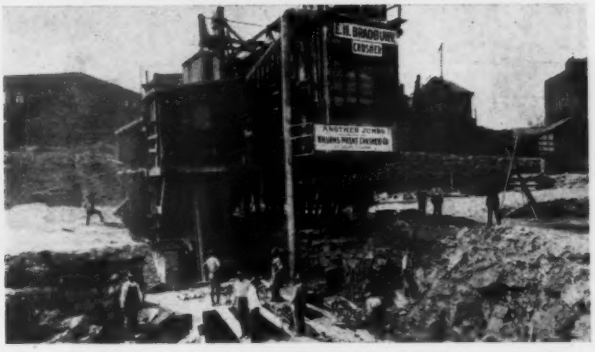
Williams

PATENT CRUSHERS GRINDERS SHREDDERS

Cut Investment and Crushing Costs In All Branches of Rock Crushing



Cement "Jumbo crusher crushing 8" to 10" limestone to ¼" to 1½" in one operation, and is not excelled in this work by any other type of crushing machinery."
RIVERSIDE PORTLAND CEMENT CO., Riverside, Cal.



Macadam "Product we are getting from Williams Jumbo crusher superior to that from tandem Gyratory and Jaw crushers I have been using."
E. H. BRADBURY, Kansas City, Mo.

The Jumbo

Used by most American cement plants as secondary crusher to largest Jaw or Gyratory. Crushes stone as large as 14" to macadam or 1½" and finer. Monarch Portland Cement Co., Humboldt, Kansas, used one for five years, crushing stone for more than 2,500,000 barrels of cement with nothing spent for repairs.

The Jumbo Junior

Reduces one man stone and smaller material to 1½" or dust. Percentage of fines when adjusted for macadam is unusually small. One Jumbo Junior replaced two other crushers at E. H. Bradbury Plant, Kansas City.

Write the Williams Engineering Dept.

Interested engineers and executives are invited to lay their problems before the Williams Engineering Department, who will gladly furnish full information, including service records, blue-prints and printed matter on the proper equipment for your work.

Agricultural Limestone "Pulverizing 15 ton per hour of 60 pound to 100 pound stone to agricultural size in one operation, with 20 horsepower."
OTTO ORTH, Webster Groves, Mo.

Williams Patent Crusher & Pulverizer Co.
800 St. Louis Ave., St. Louis, Mo.

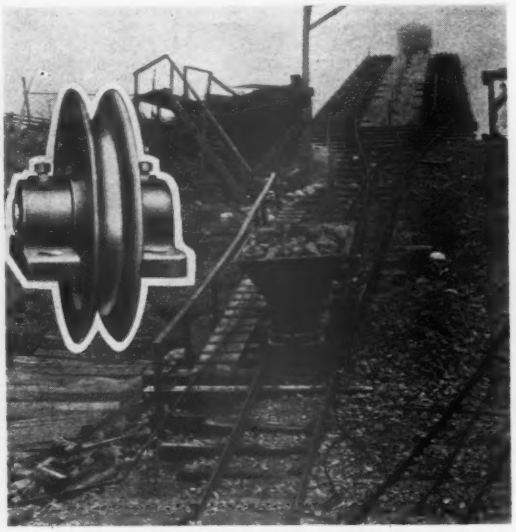
Chicago, 37 W. Van Buren St. — New York, 15 Park Row — San Francisco, 67 Second St.

Williams

PATENT CRUSHERS GRINDERS SHREDDERS

Clyde Economies for the Quarry

In the Clyde line of hoisting equipment are many units especially adapted to the quarry industry that will prove themselves as economical labor saving investments. Illustrations show a few of these. A statement of your problems will be welcomed by the Clyde engineers.



Clyde haulage hoists are usually built with single or double parallel drums. Operated with Clyde sheaves and boxes, they are very effective with rope haulage systems. Insert shows type of sheave used in this particular operation

Herewith is shown a model material storage or central plant layout. Derrick unloads from cars to stockpile, or from cars to hopper. When stockpiled it rehandles to hopper. It is highly successful, requiring minimum space for maximum capacity.

Shown above is a horizontal drum hoist for spotting cars. It can be furnished for steam, electricity, gasoline or belt drive

Guy derricks find effective use in every quarry. When Clyde hoists furnish the motive power, highly satisfactory results are obtained

All Clyde units are built to definite quality standards and are covered by rigid guarantees against original defect. Complete information furnished upon request about any unit.

CLYDE IRON WORKS SALES COMPANY

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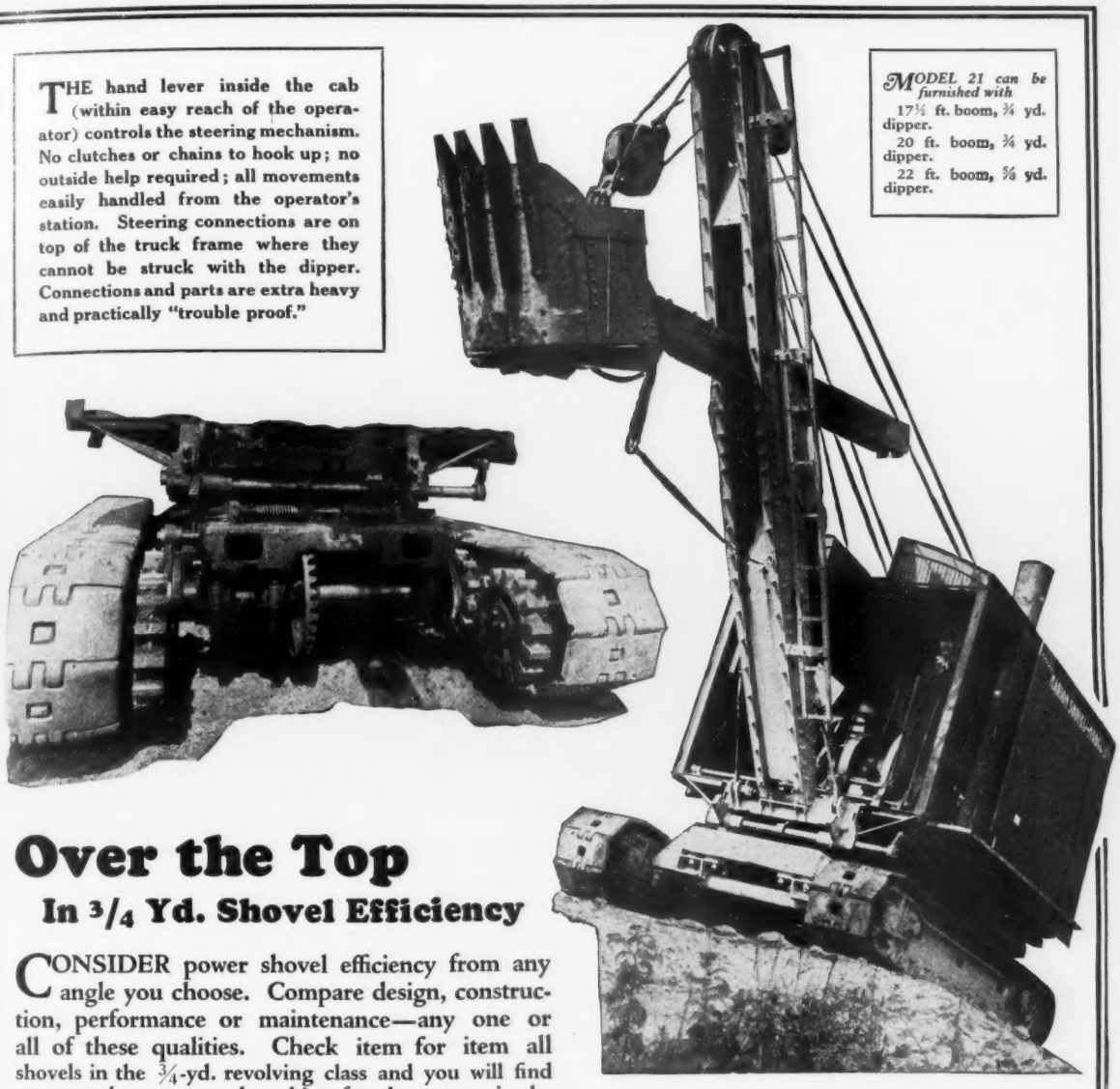
THE hand lever inside the cab (within easy reach of the operator) controls the steering mechanism. No clutches or chains to hook up; no outside help required; all movements easily handled from the operator's station. Steering connections are on top of the truck frame where they cannot be struck with the dipper. Connections and parts are extra heavy and practically "trouble proof."

MODEL 21 can be furnished with
17½ ft. boom, ¾ yd. dipper.
20 ft. boom, ¾ yd. dipper.
22 ft. boom, ⅝ yd. dipper.



Over the Top

In 3/4 Yd. Shovel Efficiency

CONSIDER power shovel efficiency from any angle you choose. Compare design, construction, performance or maintenance—any one or all of these qualities. Check item for item all shovels in the ¾-yd. revolving class and you will find greater value, more *real* machine for the money, in the new Marion 21 than in any other shovel of similar size or rating.

Power enough to handle a full size ¾ cu. yd. dipper in the hardest materials. *Speed* sufficient to maintain maximum output even under unfavorable working conditions. *Endurance* assured by proper selection of materials, best of workmanship, thorough inspection and testing.

The record of Model 21 is ample proof of its superior performance in all kinds of earth and material handling work. Before deciding, you should see one of these shovels at work and you will be convinced that it is truly the leader in its class.

Write for Bulletins 228 and 305.

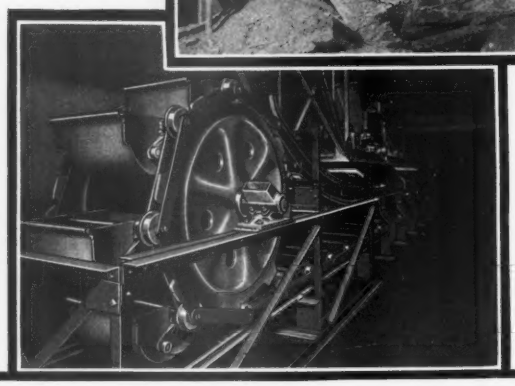
You can get the new 21 with rigid crawler trucks, four belt flexible crawlers, traction or railroad wheels. It can be quickly converted into clamshell, orangepeel, dragline or high lift shovel or material handling crane. It comes with steam, gasoline or electric for power, or extra large boiler where wood is used exclusively for fuel.

268

The Marion Steam Shovel Company

Marion Ohio.

Marion Crawler Trucks Make Hard Going Easy



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Includes

Apron Conveyors
Belt Conveyors
Bucket Elevators
Car Pullers
Chains
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Elevator Boots
Elevator Buckets
Flight Conveyors
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Pivoted Bucket Carriers
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Sand, Gravel, Stone, Cement, HANDLING EQUIPMENT

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Proof in Performance

It is significant that where the highest standard prevails in all types of sand, gravel, stone and cement handling equipment and where the standard is given finest development, Webster equipment is in demand.

When planning on your future requirements for a new plant, repairs or extensions, get in touch with Webster engineers; they are specialists in this work and their services are at your disposal. Consult them.

The Webster Mfg. Company

4500-4560 Cortland St., Chicago

Factories: Tiffin, Ohio, and Chicago. Sales Offices in Principal Cities

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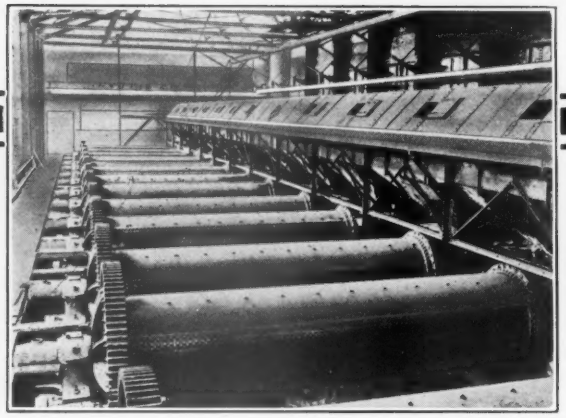


Tube Mills in Cement Plants are Lubricated with Keyso Grease

For Machinery Operating Under High Heat Conditions

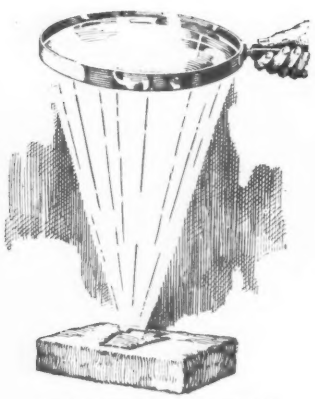
THE correct lubrication of various types of machinery operating under abnormally high radiated heat conditions has long been a problem to plant superintendents. Kiln trunnion bearings in cement mills could be cited as a good example.

Keystone-Keyso

High Melting Point Grease

like all other Keystone Products, is a pure grease scientifically manufactured from high-grade petroleum oils. By combining high heat-resisting properties with high lubricating and friction-reducing value it invariably results in decreased production costs to manufacturers and eliminates shut-downs due to incorrect lubrication.

Keystone-Keyso Grease is made in 6 densities—Nos. 40-41-42 and 43 for open well boxes; Nos. 44 and 45 for Keystone Hand Compression and Spring Automatic Grease Cups.



Send for Booklet describing Keystone-Keyso High Melting Point Greases.

THE KEYSTONE LUBRICATING CO.

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Chicago
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Established 1884

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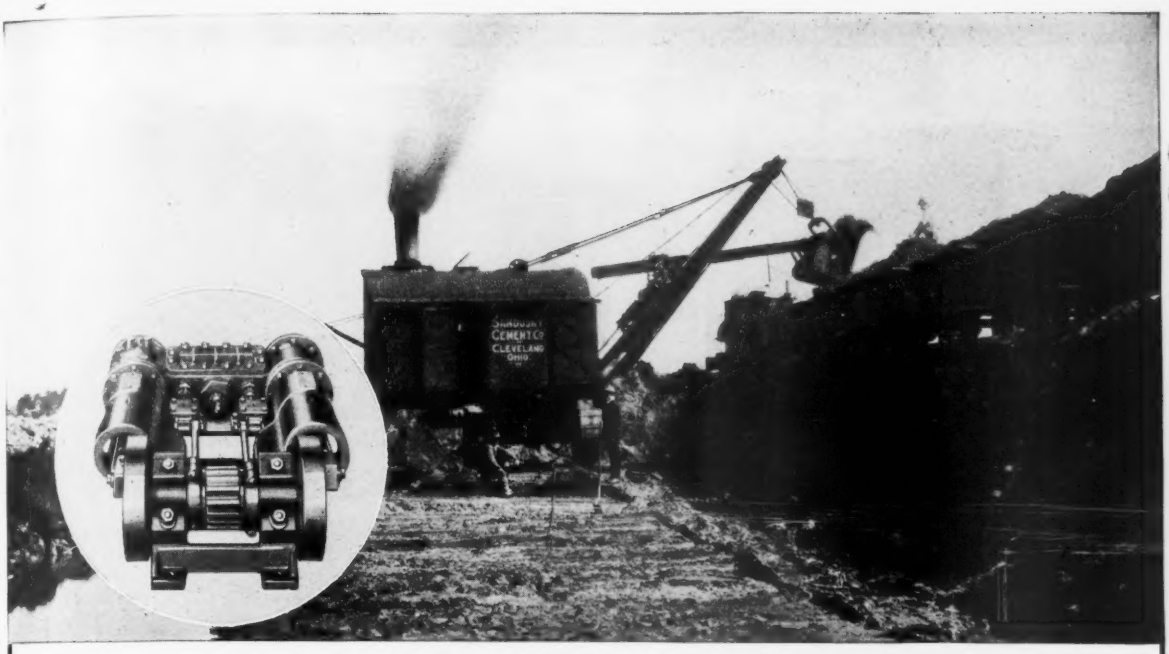


Backing the Business End

The business end must have something behind it.

It should be backed by engines that have reserve power, that run smoothly, and that are economical of steam. They should be simple in design, easy of adjustment, readily accessible and above all economical in upkeep.

Most every shovel runner knows Thew engines and has little to say against them. Thew was the pioneer in the small shovel game and has spent twenty-seven years making engines for shovels.

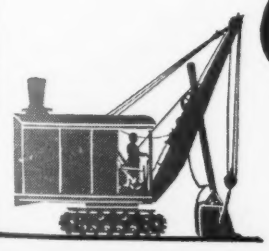
The result is a two cylinder, horizontal engine that's down flat on the turntable and boom. Its position eliminates destructive vibration.

All engines on the Thew are perfectly accessible and the bearings, stems, guides and valves are easily and quickly adjusted. Pinions are between over sized bearings. The steam chest with one cover contains all valves. The seats are marked for setting. These are reasons why Thew engines wear longer.

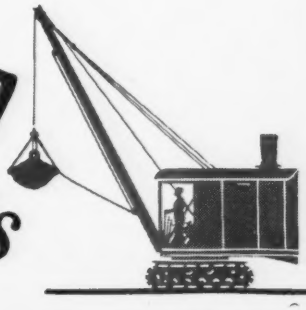
The Thew engine has a throttle reverse which means that there are few moving parts. It is simple in design and efficient in operation. Of course the turntable engines are covered with a hinged steel platform. This provision allows operator and fireman to walk over them at will.

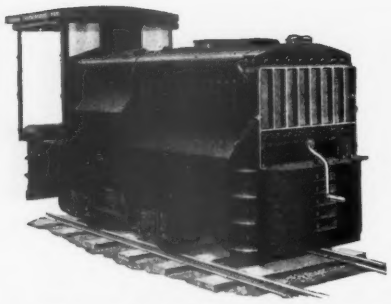
Don't forget that the engine is the heart of your shovel and that it must be backed up. This month we are mailing the second of an interesting series on shovel construction. This covers turntable details. Just ask for 223.

THE THEW SHOVEL COMPANY, LORAIN, OHIO

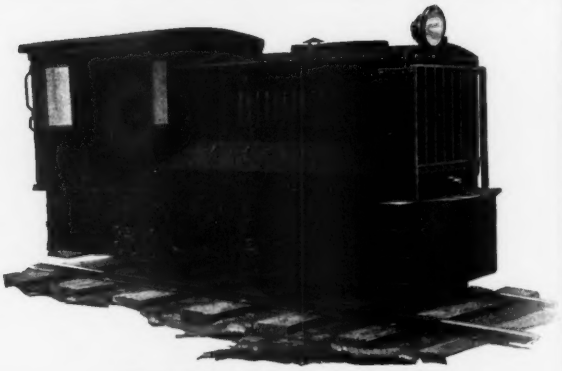


Thew Power Shovels





Plymouth Model CL, 4-ton Locomotive



Plymouth Model DL, 7-ton Locomotive

The Predominating Plymouth Locomotive

Buffalo Crushed Stone Co., Buffalo, N. Y.

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PLYMOUTH

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